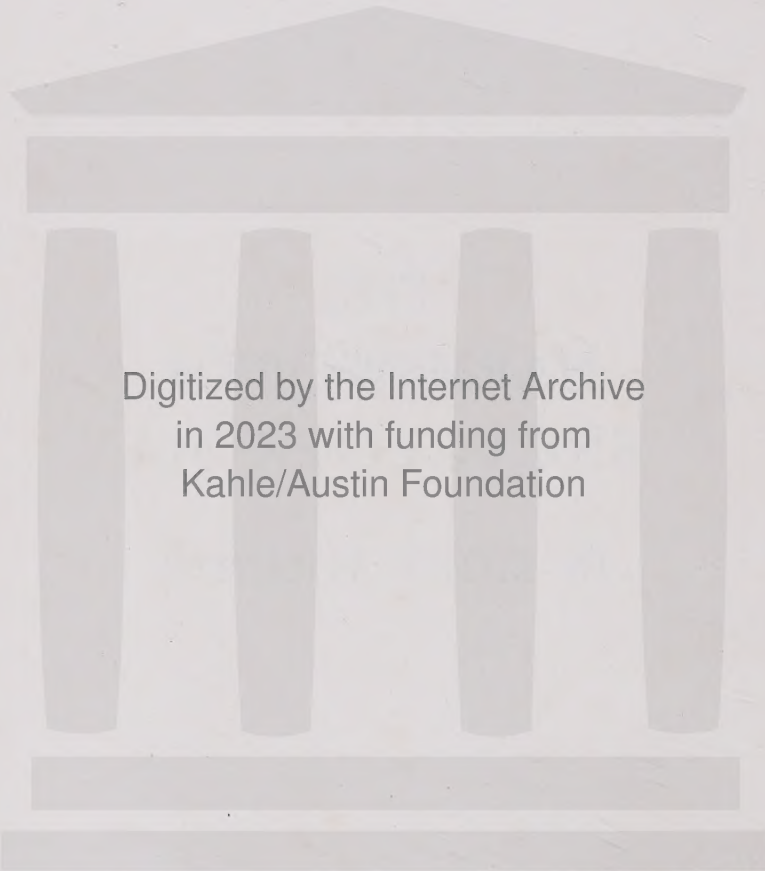




THE
HARMSWORTH
ENCYCLOPÆDIA

IN EIGHT VOLUMES



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THE HARMSWORTH ENCYCLOPÆDIA

Everybody's Book of Reference

*Containing 50,000 Articles,
profusely illustrated*

Vol. VIII. Sol-fa—Zymotic.

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LIST OF CONTRACTIONS USED IN THIS WORK.

ac., acres.	Fr., French.	S., south.
agric., agricultural.	ft., feet.	Sans., Sanskrit.
alt., altitude.	Ger., German.	seapt., seaport.
anc., ancient.	gov., government.	Slav., Slavonic.
ann., annual.	Gr., Greek.	Span., Spanish.
Ar., Arabic.	Heb., Hebrew.	sp. gr., specific gravity.
Aram., Aramaic.	I., isl., island.	sq. m., square miles.
arr., arrondissement.	ibid., the same.	stn., station.
A.S., Anglo-Saxon.	i.e., that is.	s.v., under the word.
A.V., Authorized Version.	in., inches.	Syr., Syriac.
aver., average.	Ital., Italian.	temp., temperature.
bor., borough.	Lat., Latin.	terr., territory.
b.p., boiling-point.	lat., latitude.	tn., town.
bur., burgh.	l. bk., left bank.	trans., translated.
C., Centigrade.	lit., literally.	trib., tributary.
c. (circa), about.	long., longitude.	U.S.A., United States of America.
cap., capital.	m., miles.	vil., village.
cf., compare.	m.p., melting-point.	vol., volume.
co., county; in Hungary, comitat.	mrkt. tn., market-town.	W., west.
Com., Commission.	Mt., mts., mount, mountain, -s.	wat.-pl., watering-place.
comm., commune.	munic., municipal.	yds., yards.
cub. ft., cubic feet.	N., north.	Railways—C.R., Caledonian Railway;
Dan., Danish.	N.T., New Testament.	C.P.R., Canadian Pacific Railway;
dep., department.	O.T., Old Testament.	G.E.R., Great Eastern Railway;
dist., district.	par., parish.	G. & S.W.R., Glasgow and South-
div., division.	parl., parliamentary.	Western Railway; L. & N.W.R.,
Du., Dutch.	Per., Persian.	London and North-Western Rail-
E., east.	pop., population.	way; N.B.R., North British Rail-
eccles., ecclesiastical.	Port., Portuguese.	way, etc., etc.
ed., edition; edited.	prov., province.	Bibliography—Biog. Dict., Biograph-
e.g., for example.	q.v., which see.	ical Dictionary; Encyc. Brit.,
Eng., English.	R., riv., river.	Encyclopædia Britannica; Proc.
episc., episcopal.	r. bk., right bank.	Royal Geog. Soc., Proceedings of
et seq., and the following.	R.V., Revised Version.	the Royal Geographical Society;
F., Fahrenheit.	ry., railway.	Jour., Journal; Hist., History;
fort. tn., fortified town.	ry. jn., railway junction.	Mag., Magazine, etc., etc.

THE HARMSWORTH ENCYCLOPÆDIA.

VOL. VIII.

Sol-fa, or **TONIC SOL-FA**, a system of musical notation. This method has no resemblance to the staff notation, which has been in universal use for several cen-

John Curwen (1816-80), who developed the system from a method of letter notation invented by Miss Glover of Norwich. The system consists in employing a series of syllables in such a manner as to serve both as a means of solmization and as a method of notation. In the usual practice of solfeggio the unwritten syllables do, re, mi, etc., are mentally applied by the singer to the notes on the staff; but in sol-fa no staff is used, and the initial letters of the syllables doh, ray, me, fah, soh, lah, te, in conjunction with certain signs, constitute its whole system of

bles on each side of the central row are utilized to show how modulations are effected, and by this means the pupil is taught to understand the principles of tonal and key relationship. As a system of notation, sol-fa is printed in horizontal lines, spaced into bars or measures as in the staff notation. The time values of notes are indicated by dots and dashes. A colon, short perpendicular line, or bar-line separates the 'pulses' or 'beats'; a dot is used for a half beat, and a comma for a quarter beat. The sign of prolongation is a short horizontal line; a rest is indicated by a

d'	f'	
t	m'	l
		re'
l	r'	se
se	de'	ba
s	DOH'	f
ba	TE	m
f	ta	le
m	LAH	r
	la	se
r	SOH	d
	bah	fe
d	FAH	t
t	ME	l
	ma	re
l	RAY	se
se	de	ba
s	DOH	f
ba	t	m
f	ta	
m	l	r
	se	
r	s	d
	ba	fe
d	f	
t	m	l

The Modulator.

(Copyright of Messrs. Curwen.)

turies, but it is now largely employed in schools in teaching vocal music. It first claimed public attention about 1850, and owes its rapid growth in popularity to the efforts of Rev.

Key G.

Key D.

Key G.

Key G.

notation. By adopting the principle of the movable doh, first exemplified in the mutations of solmization, the series of syllables is made to represent the constituent notes of all major scales, as these differ only in degree of pitch, the succession of intervals remaining the same. Thus the syllables used have relative, and not fixed, degrees of pitch.

In learning sol-fa, the pupil is first taught to sing from a chart, termed a 'modulator.' In this the syllables are placed one above another, and at such distances apart as to represent pictorially the series of intervals contained in a major scale; rows of sylla-

blank space; and a medium accent by a short perpendicular line, which when present takes the place of a colon. A horizontal line under two or more notes signifies that these notes are to be sung to one syllable. Chromatic notes are indicated by the addition of the letter *c* or *a*;—e.g. *re* = ray a semitone higher, *ra* = ray a semitone lower. The syllable *ba* is used for the sharpened sixth of the melodic minor scale. Notes in the first octave above or below the central octave are distinguished by the addition of the figure 1 above or below the letters, thus *d'* *d*₁; the figure 2 indicates the second octave, and so on. Doh

is always the tonic in major and lah the tonic in minor keys. The name of the key is written at the beginning of the piece, and if the music contains modulations, the new key is indicated at each change of key. The preceding example shows how the signs in sol-fa are used as equivalents for those in staff notation.

The principal merits of the sol-fa system are its comparative ease of acquirement, its development of the sense of tonality, and the cheap rate at which music in its notation may be produced. Unfortunately, it is unsuitable for instrumental music of any degree of complexity, as in its notation the rapid reading of involved passages is almost impossible. The system is therefore chiefly valuable as a simple method of teaching sight-singing. In Britain 80 per cent. of the children learning music are taught to sing from this notation. The London Tonic Sol-fa College (instituted 1869) is devoted to the training of teachers and holding of examinations. See Curwen's *New Standard Course* (1852) and *Teacher's Manual* (1864); also Stainer's *Tonic Sol-fa Primer* (1877).

Solfatara, a small extinct or dormant volcano in the vicinity of Naples (Phlegrean Fields), which is said to have emitted a stream of lava in the year 1198, but has since then been quiescent. It has served as the type of decadent volcanic activity, accompanied by decomposition of volcanic rocks effected through sulphurous exhalations. In New Zealand, Japan, W. Indies (Soufrière of St. Vincent, Guadeloupe, and Dominica), and all other volcanic regions, similar changes are frequently observed, and there is much evidence that they have taken place on a large scale in ancient volcanoes also.

Solfeggio, a vocal exercise sung to the syllables ut (or do), re, mi, fa, sol, la, si, which are used as names for the notes comprised in a major scale. The practice of this method is termed 'sol-fa-ing,' and the exposition of its principles 'solmization.' The use of the first six syllables as an aid to memorizing the relative position of the constituent notes of the scale is attributed to Guido d'Arezzo (c. 990-1050), an Italian monk. The syllable si was added at the beginning of the 17th century, when the ancient ecclesiastical modes were superseded by the modern forms of the scale. See **MUSIC**.

Solferino, vil., prov. Mantua, Italy, 7 m. S. of Lake Garda. Here the French and Sardinians, under Napoleon III., defeated the Austrians on June 24, 1859. Pop. (1901) 1,350.

Soli, an ancient Greek town, on coast of Cilicia, in Asia Minor, was founded by Argives and Rhodians. Remote as it was from Greece, the speech of its inhabitants became so barbarous as to be proverbial for uncouthness, as the word 'solecism' shows. It was destroyed by Tigranes, king of Armenia, about 80 B.C., but restored by Pompey the Great less than twenty years afterwards. There are considerable ruins.

Solicitor. By the Supreme Court of Judicature Act, 1873, the designation 'Solicitor of the Supreme Court' was given to all attorneys, solicitors, and proctors. Previously solicitor meant a practitioner entitled to sue out any writ or process, or commence, carry on, solicit, or defend any action or other proceeding in the Court of Chancery; while in the common law courts the name was attorney, and in the ecclesiastical and admiralty courts proctor. No person can be admitted a solicitor who has not served as an articulated clerk for five years, or three years in the case of university graduates, barristers, advocates, Scotch law agents, or clerks who have served for ten years prior to being articulated, or four years in the case of persons who have passed certain university examinations. Before admission three examinations must be passed—the preliminary (from which persons possessing certain educational qualifications are excused), the intermediate, and the final. On admission the solicitor's name is placed on the roll of which the Incorporated Law Society is the registrar, and an annual certificate must be taken out and an annual duty paid of £9, within ten miles of the General Post Office, London, and £6 in the country (half only for the first three years). Solicitors have a right of audience at quarter sessions where there is no bar, in county courts, coroners' inquests, the court of bankruptcy, and at petty sessions. A solicitor is an officer of the court, and subject to its disciplinary power. Applications against solicitors for improper conduct are made in the first instance to a committee of seven members appointed by the master of the rolls from among the members of the council of the Law Society. Either party may appear in person, or by counsel or solicitor. The committee, after hearing evidence, make a report. If the report finds professional misconduct, it is the duty of the society to bring it before a divisional court of the King's Bench Division. The complainant is entitled to be heard by counsel. The court may impose the punishment of striking the solicitor off the roll, or of

suspending him for a period; or, when the offence is not of a serious nature, of ordering him to pay the costs of the proceedings. Solicitors may make special agreements with their clients for their remuneration, otherwise their bills are liable to taxation by the proper officers, as to contentious business under Order lxxv. of the Rules of the Supreme Court, and as to non-contentious business under the Solicitors' Remuneration Order, 1882, made under 44 and 45 Vict. c. 44. The Justices Qualification Act, 1871 (34 and 35 Vict. c. 18), repealed the disqualification of solicitors to be justices of the peace for counties, except in the case of counties in which the solicitor carries on practice. The Colonial Solicitors Act, 1900 (63 and 64 Vict. c. 14), gives power to the King in council to make orders regulating the admission of colonial solicitors to be solicitors in England or Ireland, or law agents in Scotland, in the case of colonies where reciprocal arrangements are in force. In Ireland the law as to solicitors is similar to that in England; 'articled apprentice,' however, is the term used instead of 'articled clerk.' In Scotland business similar to that of solicitors is carried on by law agents, which term includes writers to the signet, solicitors to the supreme court, procurators in sheriff courts, and every person entitled to practise as an agent in a court of law in Scotland.

Solicitor-general, a law officer of the crown, first appointed in the reign of Edward IV. His position and duties are similar to those of the attorney-general, but he is inferior to him. He is generally a member of Parliament, but not a privy councillor, nor a cabinet minister. Scotland and Ireland have similar officials.

Solidago. See **GOLDEN ROD**.

Solids are characterized by possessing a definite shape, to which they return after being distorted by the application of external forces, provided the stresses applied have not been too great. This resistance to change of form is recognized in the hardness and elasticity of solids; while the permanent deformation produced by excessive stresses shows itself in their ductility, malleability, and brittleness. The elasticity may be either of volume or of shape; but the volume compressibility is very small and unimportant as compared with the elasticity under tensile, crushing, bending, and twisting stresses, to which, in practice, solids are subjected. In general, the strain produced is proportional to the stress exerted, until a certain point, called the elastic limit, is reached; after that the

strain increases more rapidly than the stress, and the body does not recover its original shape when the distorting stresses are removed. Solids differ in another respect from gases and liquids in that they often possess a definite structure, differing in properties according to the direction in which they are examined. Those with the same properties in every direction are called isotropic or amorphous, have an indefinite melting-point, and probably differ from the liquids more in degree than in kind; whereas those of which the properties differ with the direction are crystalline or anisotropic. These differences of property are evidenced in the different shapes of the various crystals, and their conductivities and effects on light when examined in different directions. See CRYSTALLOGRAPHY; and for the phenomena connected with the change from solid to liquid or solid to gas, and conversely, see FREEZING, SUBLIMATION, and cognate articles.

Solidus, a gold coin, struck by Constantine in place of the *aureus*, and known later as the *bezant*. Adopted by the Franks, it was in use until the time of Pepin. The silver *solidus*, however, was reckoned equal to twelve denarii or silver pennies, thus equalling a shilling. The abbreviation of the *solidus* furnishes us with the *s* in £ s. d. (*Ubrae, solidi, denarii*).

Soligalich, tn., Kostroma gov., Central Russia, 69 m. N.E. of Kostroma city, visited for its saline springs. Pop. (1897) 3,420.

Soliman. See SOLYMAN.

Solimoës. See AMAZONS and PERU.

Solingen, tn., Prussia, Rhine Province, on riv. Wupper, 13 m. by rail S.E. of Düsseldorf. It is the centre of an important steel manufacturing district, turning out cutlery especially. Pop. (1900) 45,260.

Solis, JUAN DIAZ DE (c. 1470-1516), Spanish navigator, born at Lebrija, near Seville; was associated with Pinzon in exploring the coasts of Honduras and Yucatan (1506). He succeeded Vespucci as chief pilot of Spain (1512), and in 1515 sailed in search of a route through S. America to the Pacific, when he was killed by Indians in the Rio de la Plata.

Solis y Ribadeneira, ANTONIO DE (1610-86), Spanish dramatist and historian, born at Alcalá de Henares. He began writing plays whilst a student at Salamanca (*Amor y Obligación*), and subsequently followed the school of Calderon with *Un Bobo hace Ciento*, *El Dr. Carlino*, and *La Gitanilla de Madrid*, all of which were popular. His lyrics also are pure and pleasing; but he lives

as the author of *The History of the Conquest of Mexico*, a classic, the best edition of which is that of Madrid (1683-4; Eng. trans. 1724). The author was secretary of the Indies Council.

Solitaire (*Pezophaps solitaria*), an extinct flightless pigeon, nearly allied to the dodo, which lived in the island of Rodriguez in the Indian Ocean, probably till about 1761. It had longer legs than the dodo, the male standing about 2 ft. 9 in. in height. The males had a curious excrescence on the rudimentary wings, said to have been used as a weapon. See Legaut's *Voyages et Aventures* (1708), Strickland and Melville's *The Dodo and its Kindred* (1848), and Newton's *Dictionary of Birds* (1896).

Solitary Confinement. At one time judges could add a sentence of solitary confinement, not exceeding one month at a time, or three months in a year, to a sentence of imprisonment; but by sec. 17 of the Prison Act, 1865, all confinement is separate, and anything corresponding to the old solitary confinement is only given as punishment for gross breaches of prison discipline.

Solmization. See SOLFEGGIO.

Solmona, tn., prov. Aquila degli Abruzzi, Italy, 25 m. S.W. of Chieti; is the birthplace of the poet Ovid. Pop. (1901) 17,988.

Solo, in music, originally signified an unaccompanied performance by an individual voice or instrument. The term is now used to designate any prominent part or passage of a solo nature, whether performed with or without the accompaniment of other voices or instruments.

Solofra, tn., prov. Avellino, Italy, 31 m. E. of Naples; manufactures leather and woollen goods, and is famous for its pickled pork. Near by are marble quarries. Pop. (1901) 5,691.

Solomon, the second son of David and Bathsheba, and the third king of Israel (c. 970-930 B.C.). He made an alliance with the king of Egypt by marriage, choosing wisdom as the support of his throne (1 Kings 3), and carrying out his father's plan of building a temple (5-8). But the wisdom for which he was renowned was rather that of the petty judge and the popular sage, and, be it added, the merchant, than that of the statesman or the warrior. His foreign policy consisted chiefly of treaty-making with the neighbouring powers, thus both preserving peace and giving scope to commerce, and he became fabulously wealthy; his military operations were mainly defensive—the fortification of cities and the increasing of his army; while the size of his harem, and the multitude of his officials

and retainers, caused his domestic policy to degenerate into the practical enslaving and over-taxation of his subjects, and led at his death to the disruption of the kingdom. His renown for wisdom grew after his death, and Mohammedan vies with Jew in his admiration of the wisest of kings. For the Biblical and apocryphal works attributed to Solomon, see articles on PROVERBS, ECCLESIASTES, CANTICLES (Song of Solomon). See also Farrar's *Solomon in Men of the Bible Series*.

Solomon, SOLOMON JOSEPH (1860), English painter, was born in London; settled in London after a tour in Italy and Holland. The picture which first brought him any reputation was *Cassandra* (1886); this was followed by *Samson* (1887), *Niobe* (1888), *The Judgment of Paris* (1890), *Echo and Narcissus* (1894), *Birth of Love* (1895), and a number of portraits. He was elected A.R.A. in 1896 and R.A. in 1906.

Solomon Islands, volcanic archipelago in Pacific, E. of New Guinea. They extend 700 m. from N.W. to S.E., and include Bougainville (140 m. long by 35 m. broad), Buka, Guadalcanar, Malaita, Isabel, Choiseul, and San Cristobal. The first two are under German (since 1886), the rest under British (1899), protection. Bougainville reaches 10,000 feet. The islands grow sandalwood, ebony, lignum vitae, coconuts, sweet potatoes, pine apples, and bananas. The natives are Papuans and Polynesians. German islands—area, 4,200 sq. m.; pop. 45,000. British—area, 8,357 sq. m.; pop. 150,000.

Solomon's Seal, a British liliaceous plant (*Polygonatum multiflorum*), occasionally found in woods. It is a tall-growing plant, with round stem and elliptical leaves all pointing one way. It bears green-tipped white flowers, shaped somewhat after the manner of round seals, whence the popular name is derived.

Solon (c. 638-c. 558 B.C.), one of the greatest statesmen of ancient Athens. His earliest achievement was to arouse his countrymen to conquer Salamis, which had been seized by the Megarians. Not long afterwards he was made by his countrymen sole archon, and commissioned (594 B.C.) to reform the constitution; and this he did.

At the beginning of the 6th century B.C. both the small landowners and the free labourers of Attica were in great economic distress. Money was very scarce, while the cost of living was increasing. The consequence was that the small landowners had to mortgage their estates to wealthy landowners and capitalists; while the free labourers were forced to mortgage their persons, and in

large numbers became the slaves of the capitalists. These were the conditions which Solon had to face, and he met them by a famous enactment called the *Seisachtheia*, or 'shaking off of burdens,' which annulled all existing debts and mortgages on both lands and persons, and provided that henceforth no debtors should be enslaved. Other economical reforms forbade the exportation of Attic produce except olive oil, and replaced the *Æginean* by the *Euboic* system of coinage, thus bringing Athens into closer touch with *Chalcis*, *Corinth*, and their colonies.

Solon was the real founder of Athenian democracy, although the constitution of the state as he left it was by no means democratic. To the three existing classes he added a fourth, the labourers, and gave them a vote in the assembly, which made laws, elected magistrates, and decided all important public business; but the archonship was still restricted to the first class, and the other magistracies to the next two. The council of four hundred, instituted by him to prepare business for the assembly, was also only chosen from the first three classes. But he established the popular jury courts, and gave every citizen a seat in them. Thus even the poorest Athenians had a voice in the election of their magistrates, and also controlled their conduct, as they were liable to be held to account in these courts on retiring from office. Another reform of Solon's was the use of the lot in the election of magistrates. This device was partly religious, as it was held to leave the choice to the gods; but it also served for the protection of minorities, and lessened party strife. For the archonship, however, ten candidates were elected from each of the four tribes, and then the nine archons were taken from among these forty by lot. Minor enactments imposed penalties on idleness and extravagance, and gave liberty for disposing of property by will when a man had no heirs of his body. Solon left Athens immediately after his archonship, and travelled for ten years or more. To this period are assigned his conversations with *Croesus*; but chronological reasons show them to be historically impossible. He was accounted one of the Seven Sages of Greece, and the wisest of them all. He lived long enough to see his constitution overthrown by the tyranny of *Pisistratus*.

See *Plutarch's Life*, and *Aristotle's Constitution of Athens* (ed. with Eng. trans. by Kenyon, 1891), and *Greenidge's Handbook of Greek Constitutional History* (1896).

Solonovka, health resort, Siberia, Tomsk gov., in the *Kulunda* steppe, 110 m. from *Kamen* on the Ob.

Solo Islands. See *TIMOR*.

Solovetski, isls. and monastery in White Sea, Russia, at entrance of Gulf of *Onega*. On the principal island (15 m. by 11 m.) stands a famous monastery (founded 1429), with two 16th-century churches, an observatory, a biological station, and a port and dockyard (where even ships of war are repaired). Hospitality is annually shown to about 9,000 pilgrims. It was unsuccessfully attacked by the British in 1854. It has frequently served as a place of exile for important prisoners of state and disgraced ministers.

Solo Whist, a game of cards, a modification of the American game of Boston. It is played as *Ghent whist* in Flanders and as *whist* in Holland, and was brought from the latter country to London about 1852. It is played by four persons with a full pack of fifty-two cards, which have the same value and order as in orthodox whist, although there is no scoring for honours in the trump suit. The cards are served out by the dealer three at a time to each player, the last four cards being given singly, and the final one turned up as the trump card. The 'calls' or 'declarations' (see below) are as follows:—(1.) Proposal and acceptance. In this, the only voluntary partnership in solo whist, the proposer asks for a partner or acceptor to join with him in an attempt to make not less than eight tricks. Should a player accept the proposal, the partners do not necessarily sit opposite each other, but play as they sit. When the first player (the one to the left of the dealer) has made no declaration, he may accept a subsequent proposal; but under no other circumstances can a player who has once passed be permitted to accept or make any other declaration. (2.) The solo is the announcement by one player that he will make not less than five tricks from his own hand, the other three hands playing in united opposition to him. (3.) The *misère*. This is the attempt by one player not to take a single trick, the game being over immediately the caller is forced to win one. There are no trumps in a *misère*. (4.) The abundance is the announcement by the caller to make from his own hand not less than nine tricks. He has the privilege of selecting his own trump suit, and must announce it, but not until all the other players have confirmed the declaration by passing. An abundance in the original trumps supersedes one called in a plain suit. (5.) *Misère ouverte* is the same as a *misère*,

only in this call immediately after the first trick has been played the caller (but not his adversaries) must expose his remaining twelve cards face upwards on the table. (6.) *Abondance déclarée*. This is a declaration by one player to make the whole thirteen tricks. There are no trumps, and the caller has the first lead out. The game ceases immediately the caller loses a trick. Every deal is a complete game in itself, the stakes and over or under tricks being paid immediately it is played out, so that there is no score to be kept. Every player in turn has the opportunity of declaring; but except in the case of a player accepting a proposal, each succeeding declaration must be of higher value. Should a proposal be made and all the other players 'pass,' the proposer can raise his declaration to a solo or any superior call. Any one who has declared and been overcalled may amend his call to one still higher, and this competitive process can go on until a player retires from the contest by saying, 'I pass,' or *abondance déclarée* is reached. The highest call becomes the object of the game, and the player to the left of the dealer leads out to the first trick, except in the case of *abondance déclarée*. In proposals and acceptances, solos, and abundances any over or under tricks have to be paid for in addition to the stakes. The stake of the proposal and acceptance and the solo is usually fixed at one price; the *misère* stake is, as a rule, double that of a solo; the abundance stake three times the price of a solo; the *misère ouverte* should invariably be double that of the *misère*; and the abundance *déclarée* twice that of the abundance. Over or under tricks should be one-fourth or less, but never more than one-fourth of the proposal and acceptance stake. Exposed cards, revokes, and cards played out of turn are penalized much on the same lines as at whist. On the discovery of a revoke or a wrong division of cards with the opponents, the caller, his own share being correct, can claim the stakes without playing the game to a conclusion. The method of playing the cards is the same as at regular whist. See *Wilks's Handbook of Solo Whist* (1899) and *Green's Solo Whist* (1894).

Solstice, a point on the ecliptic midway between the equinoxes, where the sun, reversing its motion in declination, seems to stand still. The summer solstice, passed June 21 or 22, coincides with the longest day, the sun then attaining its maximum distance of $23\frac{1}{2}^{\circ}$ from the equator; the winter solstice, passed about December 22, when the sun is farthest south, coincides with the shortest day.

Solubility. See SOLUTIONS.
Soluble Glass, or **WATER GLASS**, a sodium silicate in which the sodium is united with from two to four equivalents of silica. It is prepared by fusing silica in the form of sand or flints with sodium carbonate, or with sodium sulphate and carbon, and extracting the product with water. An alternative method consists in heating the silica in as soluble a form as possible with a solution of caustic soda under pressure. Soluble glass forms a syrupy solution that is decomposed by acids. If the acid is concentrated, hydrated silica is set free in the solid form; but if the solutions are dilute, the silicic acid remains in solution for some time, though it eventually gelatinizes and becomes solid. Soluble glass is valuable for checking the decay of the stone of buildings and for preparing artificial stone. It is mixed with fire clay to make a cement for furnace linings, and is also employed for fireproofing and in the manufacture of soap.

Solutions are homogeneous mixtures, of which the composition may vary continuously between limits; and though, as a rule, one of the components is a liquid, this is not necessarily the case, gaseous and some solid mixtures coming within the definition. Solutions may be classified according to the physical state of the components—*i.e.* whether they are gas mixtures, gases, liquids, or solids dissolved in liquids, or solids in solids. On the other hand, classification may be made according as the change which occurs when solution takes place is apparently a purely physical admixture—*e.g.* when naphthalene dissolves in benzene or sugar in water; or if it is probably a chemical change that takes place—*e.g.* when salt or sulphuric acid is dissolved in water. Cases such as that in which copper is said to dissolve in nitric acid are not correctly described, because the copper is not dissolved as such, but is first converted into another substance—*viz.* copper nitrate—previous to solution. In the case of solutions of gases in gases or gaseous mixtures, the pressure of a mixture of gases is, in accordance with Dalton's law of partial pressures, equal to the sum of the pressures of its components if they occupied the whole volume, each component behaving to the others as a vacuum. Gases that do not react with liquids dissolve in accordance with a law enunciated by Henry, that at a given temperature a liquid dissolves the same volume of a gas at all pressures, from which it follows that the weight of a gas dissolved by a liquid increases proportion-

ally to the pressure under which it is dissolved. Thus, immediately the pressure in a bottle of soda water is released, a large proportion of the dissolved carbon dioxide is rejected. The solubility of different gases in water or other solvents varies widely; thus, while at standard temperature and pressure 100 volumes of water only dissolve 2 volumes of hydrogen, they dissolve 4 volumes of oxygen, 180 volumes of carbon dioxide, and 105,000 volumes of ammonia. The components of mixed gases dissolve in accordance with Dalton's law of partial pressures, but neither Dalton's law nor Henry's holds good with very high pressures or very soluble gases. The solubility of most liquids and solids in liquids varies also, though in some cases the solubility is infinite: for example, some pairs of liquids will mix in any proportions. In those cases where the solubility is limited, the solution in which the limit is reached is said to be saturated, pairs of partially miscible liquids separating into layers of saturated solutions of each in the other. Thus ether shaken with water dissolves it to the extent of three per cent., ten per cent. of ether dissolving in the water. The saturation point of solutions in liquids depends on the temperature; the amount of a solid dissolved in general increases with it, though at very different rates with different substances. Thus, while 100 parts of water dissolve 35.5 parts of common salt at 0° C., and 39.6 parts at 100° C., the solubility of saltpetre increases from 13.3 to 246 over the same range. On the other hand, some solubilities diminish or may even be unchanged by temperature, the solubility increasing with temperature if solution takes place with absorption of heat, diminishing if evolution of heat occurs, and being invariable if no heat change takes place. In some cases, however, changes in solubility with temperature are caused by a change in the nature of the dissolved substances—*e.g.* in the state of its combination with water. In reality it is then the solubility of different substances that is in question. If a saturated solution is cooled or evaporated, the solid separates usually in crystals, and at once if some of the same crystals are present in the liquid; but in their absence the concentration of the solution may increase considerably, producing a super-saturated solution. Such a solution is, however, unstable, for the deposit of crystals immediately follows the introduction of a fragment of the crystalline solid, however small, and equilibrium is restored.

Solid solutions may be of two kinds—(1) those in which gases are occluded in solids, as hydrogen in palladium or in iron; (2) those in which solids dissolve in solids, forming either amorphous mixtures, such as glass, or mixed crystals, in which two isomorphous components separate together to form a crystal. The composition of the crystal may vary—in some cases from that corresponding to one compound to that corresponding to the other; in other cases such extreme limits of composition are not possible, the mixed crystals being only formed within a certain range of proportions, and outside of that range crystal solutions of more than one composition are formed, as in the case of the solutions of partially miscible liquids.

As regards the state of the dissolved substance and the change that it undergoes when solution occurs, no completely satisfactory theory has yet been advanced. The theory that best agrees with the facts is that based on the examination of the pressure that a dissolved substance can exert when in solution. This pressure, called the osmotic pressure, can be observed by separating the solution from some of the pure solvent by means of a membrane, permeable to the solvent, but not to the dissolved substance or solute. Under these circumstances solvent flows through the membrane until a pressure is set up, which in general in the case of dilute solutions is the same as that which would be exerted if the solute were distributed throughout the same space in the state of gas and in the absence of the solvent. If, then, osmotic pressure is written for gas pressure, the solute was shown by Van't Hoff to obey the same laws—namely, Boyle's, Charles's, and Avogadro's—that it would were it in the state of gas and not as solution, and hence it may be understood to be present in the solution in the same molecules as it occurs in when a gas. Again, the vapour pressure and freezing-point of solutions can be shown to depend on the osmotic pressure; and hence the molecular weight of a substance can be determined from the measurement of either the osmotic pressure or those proportions that depend on it, such as the elevation of boiling-point or depression of freezing-point when dissolved in any given solvent, and conversely. Now, while the above facts are in general true of those solutions, such as of naphthalene in benzene or sugar in water, in which no change other than the physical change of state appears to take place, the same cannot be said of

solutions of salt or hydrochloric acid in water, or in general of those solutions that conduct electricity electrolytically. In these latter cases the measurements of osmotic pressure give higher results than those that should be produced on the supposition that the solute is present in the solution in its simplest molecules. It

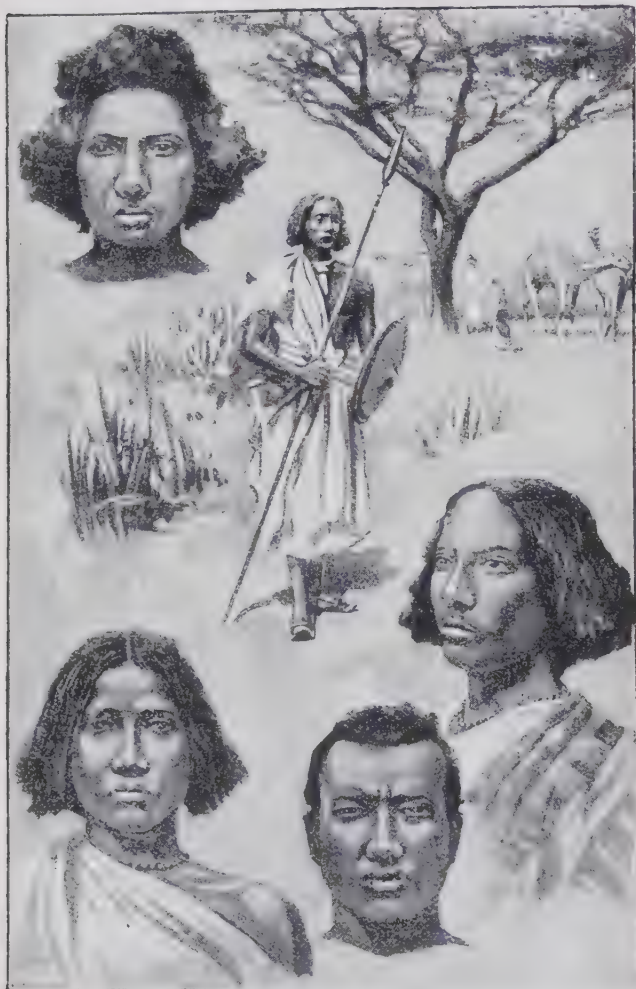
contain free Na and Cl ions. These ions differ entirely from the free elements sodium and chlorine in property, and give the characteristic features of the solution, the difference being due to the electric charges of the ions when separation on solution takes place, the sodium ion being charged positively and the chlo-

as shown by Faraday, on the amount of current passing, and independent of the stability of the salt electrolyzed. Again, salts formed by the union of different metals with the same acid radical exhibit the same properties as regards the acid radical when in solution, and similarly with the same metal and different acid radicals; while on neutralizing equivalent quantities of different acids, equal quantities of heat are evolved. Both facts are easily explicable if it is believed that the positive and negative ions are independent, and that when neutralization takes place it is the union of hydrogen and hydroxyl ions to form water, the others present being unchanged. On the other hand, there are discrepancies from the simple theory. Account must be taken of the rôle of the solvent in associating itself with the solute and with the ions; and the action of these on each other, which in actuality must undoubtedly play an important part in many if not all cases of solution, must be determined before the theory can be accepted as entirely satisfactory. See *ELECTROLYSIS*, and *Ostwald's Solutions* (trans. by Pattison Muir, 1891), and *Whetham's Theory of Solutions* (1902).

Solvents. See **SOLUTIONS**.

Solway Firth, inlet of the Irish Sea, separating Cumberland, England, from the shires of Kirkcudbright and Dumfries, Scotland. It extends N.E. for 36 m. The Derwent and the Eden enter from the English side; the Esk, the Annan, the Nith, the Dee, and the Urr from the Scottish side. The caves and fisheries find a place in Scott's *Redgauntlet* and *Guy Mannering*. The salmon fisheries are very valuable. The tides are of extraordinary rapidity.

Solyman, or **SULEIMAN II.** (1496-1566), Ottoman sultan, surnamed 'the Great' or 'the Magnificent,' ascended the throne in 1520. His reign marks the highest point in power reached by the Ottoman empire. He conquered most of Hungary and all Transylvania, and seven times invaded W. Europe. In 1523 he captured the island of Rhodes; in 1526 won the battle of Mohacs, in which Lewis, king of Hungary, and an immense number of Hungarians perished; and in 1529 took Ofen and attacked Vienna. His failure to take that city marks an epoch in European history. In 1533 he entered upon a series of wars with Persia, which continued till 1554. In 1547, by an agreement with the Hapsburgs, he was left in possession of the greater part of Hungary and Transylvania. During these years Fran-



Somali Types.

has therefore been supposed that dissolved salts become dissociated, on solution taking place, into the ions that are separated if such a solution is electrolyzed. Thus a solution of common salt, sodium chloride, NaCl, exerts a greater osmotic pressure than it should exert if it contained NaCl molecules, and is thus believed to

rine ion negatively. Such a view, though somewhat startling at first sight, fits in very well with the facts. Thus the electric conductivity of such solutions increases with the excess of the osmotic pressure over that corresponding to the unionized molecule, and the quantity of ion set free on electrolysis is dependent,

cis I. of France found the Turkish corsairs valuable allies during his wars with Charles V. Of these, Barbarossa was the most celebrated. In 1565 Malta was unsuccessfully attacked by Solymán's forces. In the following year Solymán again invaded Hungary, but died while besieging Szigeth. See TURKEY.

Soma, or **HOMA**, one of the plants said to provide the ambrosia of the gods. A branch of this sacred plant is introduced into nearly all the ancient mysteries. The ninth book of the *Rigveda-Samhitā* consists of numerous hymns intended to be recited in honour of the soma juice whilst in process of fermentation. Various plants with

are a somewhat wild, restless, and treacherous people: lawless nomads in the interior; fishers, traders, and caravan leaders on the seaboard. See F. L. James's *The Unknown Horn of Africa* (1888), L. Dal Verme's *Il Paese dei Somali* (1889), C. G. Nurse's 'Through Somaliland' in *Geog. Jour.* (1891).

Somaliland, a part of E. Africa jutting into the Indian Ocean, and terminating at Cape Gardafui, with the Red Sea and the Gulf of Aden on the N. It extends considerably over 300,000 sq. m. (not including the 100,000 sq. m. of S. Somaliland, with a population of 250,000, attached to British E. Africa), and is divided into British (60,000 sq. m.), French

the 'Mad Mullah,' a hostile Somali leader, between 1901 and 1905. French Somaliland, also on the Gulf of Aden, was acquired in 1855 by the purchase from Turkey of the port of Obok. The population is about 200,000. Jibuti is the new capital. The seat of government of Italian Somaliland was Massowah (pop. 328,000), in the colony of Eritrea. Italy in 1889 declared a protectorate over Abyssinia and Somaliland, but it was repudiated in 1893 by the former country. See Wolverton's *Sport in Somaliland* (1894), Peel's *Somaliland* (1900), Pease's *Somaliland* (1902), M'Neill's *In Pursuit of the 'Mad' Mullah* (1902), Swayne's *Somaliland* (1903), Eyre's *Despatches*



milky juice are said to have been the true soma, notably *Asclepias acida* and *Periploca aphylla*.

Somali, a main branch of the E. Hamites, whose domain coincides with the Somali peninsula of Africa. There are three main divisions, grouped in innumerable clans or septs, each under its own chief. The Somali are taller (5ft. 8 to 5ft. 10 in. and even 6 ft.) than the Gallas and darker (deep brown), with smaller and longer heads, rather full lips, slightly arched nose, long, crisp black hair, slender extremities. But the type is modified in different places, both by Arab and Negro interminglings. All are Mohammedans. In general they

(50,000 sq. m.), Italian, and Abyssinian (100,000 sq. m. each). It is an undulating plateau of moderate elevation. Only one river, the Juba, in the S., reaches the sea. The country is barren, covered with scanty herbage of scrub and herbaceous grasses. The trade is in myrrh, hides, ostrich feathers, coffee, and, most of all, salt. The population, perhaps 1,000,000, is mostly composed of nomadic Somalis. In 1884 Britain seized the more mountainous part of the Somali coast opposite Aden. The population of British Somaliland is about 300,000. Imports (1904), £327,747; exports, £291,922. There were many military expeditions against

(1904), Brochetti's *Somalia e Benadir* (1899), and Jennings and Addison's *With the Abyssinians in Somaliland* (1905).

Sombrerete, tn. in Zacatecas state, Mexico, 85 m. N.W. of Zacatecas; has valuable silver mines. Pop. 10,082.

Sombrero, a felt hat with very broad brim widely used throughout Spanish America and the southern United States.

Somers, SIR GEORGE (1554-1610), Elizabethan seaman and adventurer, was born at Lyme Regis, Dorsetshire. He was engaged in buccaneering expeditions against the Spaniards; but in 1609 he was one of the founders of the Virginia Company, and on

his voyage out to the colony was wrecked on the Bermudas, which were for some time known as Somers Is. He and his company, having built small vessels, escaped to Virginia. See Doyle's *The English in America* (1882).

Somers, LORD JOHN (1651-1716), English statesman, was born at Claines, near Worcester. Called to the bar in 1676, he early became an authority on civil and constitutional law, and was junior counsel for the seven bishops in 1688. After the revolution he sat in Parliament for Worcester, and is largely responsible for the Declaration of Rights. In 1692 he became attorney-general, and from 1697 to 1700 was lord chancellor. He had great influence with William III. During Queen Anne's reign he became virtual head of the Whig junta. See Maddock's *Life and Writings of Somers* (1812), and *The Somers Papers*, ed. by Sir Walter Scott (1809-13).

Somersby, vil., Lincolnshire, England, on the Wolds, 7 m. N.E. of Horncastle; birthplace of Tennyson in 1809.

Somerset, DUKES OF. The first Duke of Somerset was John Beaufort (1403-44), eldest son of John of Gaunt, by Catherine Swynford. He fought with Henry V. in France, and was made duke in 1443. He was succeeded by Edmund Beaufort (d. 1455), a younger brother. Edmund was a great statesman and general. He was killed at the first battle of St. Albans, which also proved fatal to his sons, thus terminating the male line. The family name of the present bearers of the title is Seymour, a corruption of St. Maur. Sir Edward Seymour (1506-52), a descendant of a Norman family which settled in 1240 at Penhow in Monmouthshire, attended Henry VIII. at the Field of the Cloth of Gold (1520), and became successively lord chamberlain and lord treasurer of England, earl marshal, protector of the king, and was created Duke of Somerset in 1547, but was executed for felony (Jan. 22, 1552). His son Edward (1539-1621) was created Baron Beauchamp and Earl of Hertford by Queen Elizabeth in 1558 or 1559. He incurred the royal displeasure by his marriage with Lady Catherine Grey, great granddaughter of Henry VII. For this he was imprisoned and fined £15,000. He was succeeded by his grandson William, who had to flee the country for contracting a marriage with James I.'s cousin, Lady Arabella Stuart. On the accession of Charles II. the dukedom was revived in his person. The sixth duke, Charles Seymour (1662-1748), was, according to Macaulay, "a man in whom the pride of birth and rank

amounted almost to a disease." Contemporary literature is full of anecdotes of his absurd vanity. His son Algernon, having no surviving male issue, was, in honour of his maternal descent, created (1749) Earl of Northumberland, with a special remainder to his son-in-law, Sir Hugh Smithson, and also Earl of Egremont, with special remainder to his nephews. At his death the Somerset title was claimed by Sir Edward Seymour, a descendant of the first duke by his first marriage, and his claim was allowed. The earldom of Egremont devolved on his nephew Sir Charles Wyndham; the barony of Percy devolved on his daughter. The Hertford title became extinct, but it was conferred on Francis Seymour, a cousin of the eighth duke. His great-grandson was Baron Alcester.



Lady Henry Somerset.

(Photo by Robinson & Sons, Redhill.)

Somerset, LADY HENRY (1851), president of the National British Women's Temperance Association, a prominent temperance advocate, first distinguished herself by the establishment of *The Woman's Signal*, and afterwards founded an industrial farm colony, the earliest of its kind, for inebriate women at Duxhurst in Surrey, and a home for training workhouse children.

Somerset, ROBERT CARR (or KER), EARL OF, and VISCOUNT ROCHESTER (1589-1645), was descended from the Kers of Ferniehurst, being born near Jedburgh. His beauty and polished manners won James I.'s favour. His rise to wealth and honours was rapid. Convicted of poisoning Overbury, he retired from court with his infamous wife, the divorced Countess of Essex.

Somerset House, buildings in the Palladian style, erected in London (1776-86), on the site of the Duke of Somerset's palace. With access both from the Strand and the Thames Embankment, they house a number of public offices, such as the Registrar-General's, and those of Wills and Probate, Inland Revenue, Audit and Exchequer, in addition to King's College. See R. B. Needham's *Somerset House* (1904).

Somersetshire, maritime co., England, on s. of Bristol Channel; coast generally low, bold in places (Minehead), with Bridgewater and smaller bays. The surface is traversed by short ranges—e.g. the Mendip and Quantock Hills, enclosing a wide plain; the Bridgewater Level is broken by the low Polden Hills. In the w., partly in Devon, is Exmoor, with Dunkery Beacon (1,707 ft.); s.w. are the Blackdown Hills, and part of the old Forest of Selwood. The Parret drains the centre; other rivers are Lower Avon (Gloucestershire border) and Axe. The scenery is in many parts very picturesque, and in the Mendip Hills there are caverns. Agriculture, especially dairy-farming, is the principal industry (Cheddar cheese being a special product), and there are extensive orchards. Minerals include coal, building stone, slate, and fuller's earth. Woollen manufactures, formerly very important, are still carried on to a limited extent (Frome); other manufactures are gloves, sailcloth, horsehair fabrics, and bathbricks. The county returns seven members to Parliament. Area (ancient county), 1,630 sq. m.; pop. (1901) 508,250: (administrative county), 1,616 sq. m.; pop. (1901) 385,111.

Somers Islands. See BERMUDAS.

Somersworth, city, Stafford co., New Hampshire, U.S.A., 35 m. E. of Concord; manufactures filters. Pop. (1900) 7,023.

Somerville, city, Middlesex co., Massachusetts, U.S.A., adjoining Boston. Pop. (1900) 61,643.

Somerville, MRS. MARY (1780-1872), Scottish writer, popularizer of physical science, was born at Jedburgh. At first in Edinburgh, and after 1816 in London, she lived in the leading scientific circles. She became widely known in consequence of a Royal Society paper in 1826 on the *Magnetic Properties of the Violet Rays of the Solar Spectrum*, and in 1831 she issued, in Brougham's Library of Useful Knowledge, a translation of Laplace's *Celestial Mechanism of the Heavens*. She subsequently published *The Connection of the Physical Sciences* (1834); *Physical Geography* (1848); *Molecular and Microscopic Science* (1866). See her

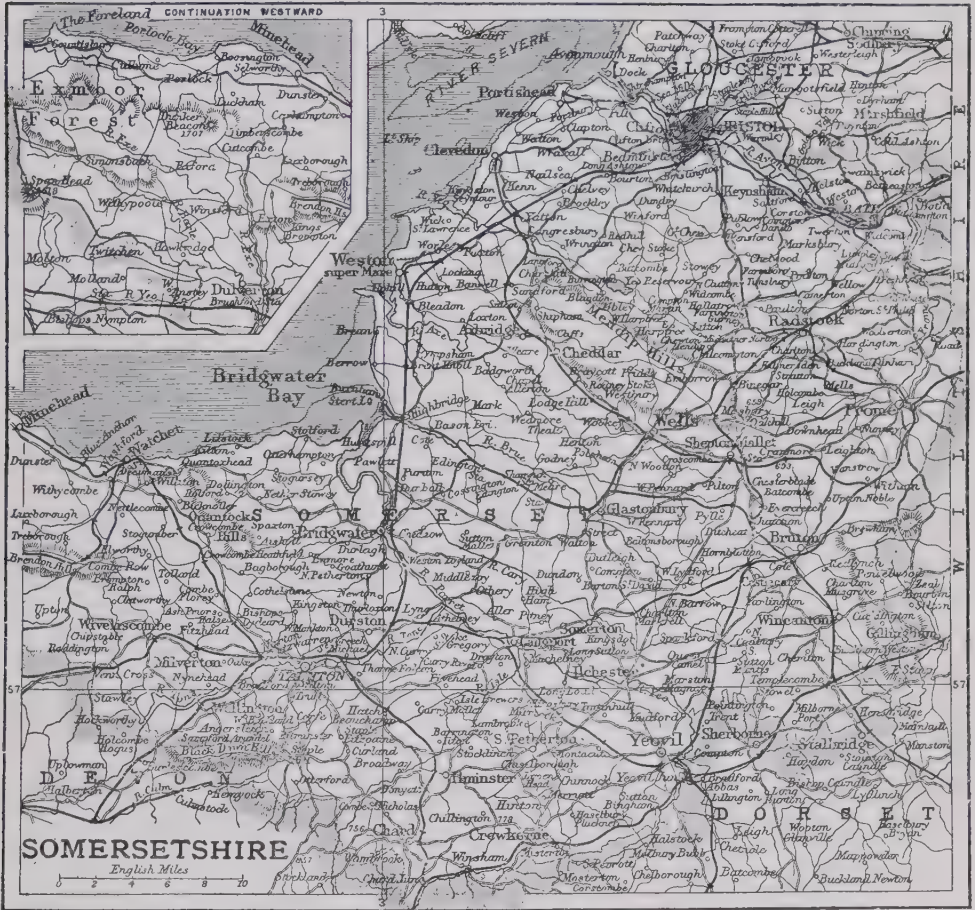
Autobiography (1873). Somerville College, Oxford, takes its name from her.

Somerville, WILLIAM (1675-1742), English poet, was born at Colwich, Staffordshire, and became a typical hunting squire. He was a poetical correspondent of Allan Ramsay. Somerville wrote *The Two Springs, a Fable* (1725); *Occasional Poems* (1727);

Mrs. Mary.) The students number nearly ninety.

Somme, maritime dep. (formed out of old province of Picardy), N. France, traversed by the Somme, covers 2,443 sq. m. Its surface is undulating. Agriculture, linen, hemp, and cotton manufactures, and sugar-refining are the chief industries. Amiens is the capital. Pop. (1901) 537,848.

nambulist's steps may sometimes be directed towards an object about which he has been troubled or anxious when awake. The memory of such acted dreams varies in different individuals. Some have no memory of the sleep walk, others have a hazy remembrance of a vague journey, but in few do the impressions correspond with the things done.



The Chase (1735; ed. by Hugh Thomson, 1896), a notable objective poem and the author's outstanding work; *Hobbinol, or the Rural Games* (1740); *Field Sports*, a poem on hawking (1742). His *Poetical Works* appeared in 1801. See Johnson's *Lives of the Poets* (1790), and *Lives* by Chalmers (1810) and Sanford (1819).

Somerville College for Women, Oxford, was founded in 1879, and named after Mrs. Somerville. (See SOMERVILLE,

Somnambulism. In abnormal conditions of sleep the motor powers may waken while the controlling centres are still asleep. Such a result is manifested by sleep-talking (somniloquism) or by sleep-walking (somnambulism). Some persons in this condition conduct long and fairly coherent conversations, and reply rationally to those who address them; others utter mere nonsense both in soliloquy and in reply to questions. A som-

While some of the faculties are in abeyance, others are in a state of exaltation, so that physical and mental feats which are beyond his waking powers are sometimes performed with ease by the sleeping somnambulist. Somnambulism occurs chiefly in those of neurotic type and is commonly associated with epilepsy and with hysteria. It must be regarded as a disorder of sleep. Mesmerism or hypnotism may be described as an artificial somnambulism.

bulism. In the curious condition known as daymare, in some respects the opposite to the somnambulistic and somnolient states, the conscious controlling faculty awakes before the motor faculties. This may occur in healthy people, and is sometimes manifested in those who sleep too much. After an afternoon sleep the patient finds himself widely awake, and painfully conscious that he cannot move a single muscle by voluntary effort. The condition does not, as a rule, last more than a few seconds. The neurotic temperament must be combated by care of the general health and by avoidance of late hours and exciting amusements. A quiet, regular life, with open-air exercise, is most efficient in producing natural, restful sleep.

Somnath, tn., on S. coast of Kathiawar peninsula, Bombay, India, 40 m. W.N.W. of Diu, contains interesting ruins and Mohammedan tombs and Hindu shrines. From one large Hindu temple, dedicated to Siva, Mahmud of Ghazni carried off (1024) great wealth, including (tradition says) the gates of the temple. In 1842 Lord Ellenborough brought back from Afghanistan and deposited at Delhi what purported to be the same ancient gates.

Somnus, in ancient Roman mythology, the god of sleep, corresponding to the Greek Hypnos; called a son of Night and the brother of Death. In works of art he is represented as a youth sleeping or holding an inverted torch.

Sonata, a species of instrumental musical composition analogous in form to the modern orchestral symphony. It came into existence in the early part of the 17th century, was for a considerable period written almost exclusively for stringed instruments, and until near the close of the century its principal movements, like those of the suite, were frequently based upon old dance rhythms. Prominent names associated with its development are those of Biber, Corelli, Tartini, Domenico Scarlatti, J. S. Bach, Haydn, Mozart, Clementi, and Beethoven. The earlier forms of sonata usually contained a principal or solo part, the other parts being chiefly in the nature of accompaniments. In the later forms the number of movements became restricted to either three or four, and from about the middle of the 18th century sonatas have been written almost invariably either for a solo instrument alone, or for a combination of not more than two instruments; when in the latter form—e.g. for violin and piano—the parts are so constructed that neither is complete without the other. See **MUSIC**.

Sonchus, a genus of plants belonging to the order Compositæ, characterized by all the florets being bisexual and strap-shaped. The flowers have an imbricated involucre, and the fruit is flattened and not beaked. The pappus is hairy. *S. oleraceus* is the common milk-thistle or sow-thistle. *S. arvensis*, the corn sow-thistle, much resembles the last species, but has an unbranched stem and large flowers.

Sonderborg, chief tn., seapt., and seaside resort, Alsens l., prov. Schleswig-Holstein, Prussia, in Baltic. Pop. (1900) 5,522.

Sonderbund War, the civil war waged, from religious motives, in November 1847 in Switzerland. The overthrow of the Liberals in Zürich (1839) in consequence of their call of Strauss to a chair of theology in the university, the suppression by the victorious Liberals of the eight great monasteries in the Aargau (1841), and the victory of the Clericals in Lucerne (1841) led to a 'Separate League' (*Sonderbund*) between the seven Roman Catholic cantons (September 1843). In 1844 the crushing of the Liberals in Valais, and the resolve of Lucerne (then the capital of the confederation for two years) to call in the Jesuits, further inflamed political and religious passions, and in December 1845 an 'armed Sonderbund' was formed by the seven cantons (Uri, Schwyz, Unterwalden, Lucerne, Zug, Fribourg, and Valais). War was decided on by the Diet on Nov. 4, 1847. It ended in the complete defeat of the Sonderbund, the chief fight being at Gislikon (November 23). The result of the war was the establishment of a new federal constitution (Sept. 12, 1848). See G. H. Dufour's *Der Sonderbunds-krieg* (1876).

Sondershausen, tn., Germany, cap. of principality of Schwarzburg-Sondershausen, 29 m. N.N.W. of Erfurt. It has a castle and a conservatory of music. Pop. (1900) 7,054.

Sondrio, tn., cap. of prov. of same name, Lombardy, N. Italy, on the Adda, 25 m. E. of Lake Como; manufactures pottery and silk. Pop. (1901) 7,707.

Song, a short metrical poem suitable for singing. The union of poetry and music was one of the earliest forms of musical composition, and consequently the national melodies of all countries are almost indissolubly associated with their songs. In the simplest musical setting of a song the same melody is used for each verse, and may be sung with or without accompaniment; but this form of composition is only satisfactory when the sentiments are all similar. Language

and music are only perfectly united when the music enhances the meaning of the words; the recognition of this principle resulted in the creation of the modern art-song. In this the accompaniment is regarded as an integral part of the composition, and equal in importance to the vocal part. Schubert is generally considered to have been the first great exponent of the art-song, and amongst other eminent composers in this form were Loewe, Schumann, Mendelssohn, and Brahms.

Song-chin, port on N.E. coast of Korea, 130 m. N. of Wonsan; opened to foreign trade in 1899.

Songhay, or SONRHAY, negro people, W. Sudan, Africa, on both sides of the great bend of the Niger, below Timbuktu.

Song-kol, or RED RIVER, flowing through Chinese prov. Yunnan, and for more than 420 m. S.E. through Tong-king, discharges by several mouths into the Gulf of Tong-king. It runs from 20 to 26 ft. higher in August and September than in December and January. Although there are numerous rapids between Yenbai and Laokai, it is navigable to the latter place.

Song Schools in Scotland. Of these institutions, founded by the Roman Catholic Church, several were established as early as the 13th century. Before reformation the chief subjects taught were 'music, meaners, and vertu;' but at a subsequent period the pupils also received instruction in mathematics, Latin, and other subjects. By the beginning of the 18th century most of them had ceased to exist. One of the few survivors is that in Peebles. The school is in connection with the parish church. See Grant's *History of the Burgh Schools of Scotland* (1876).

Song-thrush, or MAVIS (*Turdus musicus*), is one of the common European thrushes. It is about eight inches in length and twelve in wing extent. The upper plumage is yellowish brown; the wing coverts are tipped with reddish yellow; the fore neck and breast are yellowish, and are closely marked with dark-brown spots; the under plumage is white. See **THRUSH**.

Sonmiáni, seapt. tn., Baluchistan, 49 m. N.W. of Karachi. Pop. 400.

Sonnblick, mt. (11,190 ft.), Salzburg, Austria, with a meteorological observatory (1886).

Sonnenschein, WILLIAM SWAN (1855), English publisher, was born in London, and in 1878 started business as a publisher. As an author he is known by *The Best Books* (1887; 5th ed. 1905) and *A Reader's Guide to Contemporary Literature* (1895; 2nd ed. 1901).

Sonnet, originally a poem sung to a musical accompaniment; but the present normal sense is a poem of fourteen decasyllable iambic lines, divided into two groups of eight lines (the octave) and six lines (the sestet) respectively. One of the most probable guesses at the origin of the sonnet makes it a development of a single stanza of a lyric *canzone*; another regards it as a combination of two types of folk-song—the Sicilian *ottava* and the Tuscan *rispetto*. The earliest sonneteer of renown was Guittone d'Arezzo. Dante, and even more Petrarch, raised the sonnet to the first place amongst Italian metres. Amongst later Italian sonneteers Grotto, Marino, Guarini, and Tasso are the chief. From Italy the sonnet passed to Provence, where it has even been claimed as native. At the renaissance it had a wide vogue. In France it was practised by Ronsard, Du Bellay, Jodelle, Desportes, and other members of the Pléiade; in Spain by Camoëns. Germany in due course adopted it as the *Klanggedicht*. To England the sonnet was brought by the Earl of Surrey and Sir Thomas Wyatt. Then it slumbered until the *Hecatompentia* (1582) of Thomas Watson. It was, however, the *Astrophel and Stella* (1591) of Sidney that made it an Elizabethan fashion, and many collections followed before the end of the century, of which the most important are Daniel's *Delia* (1592), Constable's *Diana* (1592), Lodge's *Phyllis* (1593), Drayton's *Idea's Mirror* (1594), Spenser's *Amoretti* (1595), Greville's *Calica*; and the sonnets of Shakespeare doubtless also belong to the 16th century, although belated in publication. The earlier part of the 17th century produced little but Donne's religious sonnets and Drummond of Hawthornden's adaptations from the Italian, and with the few sonnets of Milton the mode died out until its revival, at the beginning of the 19th century, by Wordsworth. Later sonneteers include Hartley Coleridge, Keats, D. G. Rossetti, Christina Rossetti, Elizabeth Browning, and Robert Bridges. The dominant influences have been those of Wordsworth and Rossetti. The sonnet has always been looked upon as subject to strict rules of versification, especially as regards the incidence of rhyme. The earliest Italian form has two alternating rhymes for the octave and two for the sestet—thus, *ab ab ab ab cd cd cd*. In the fully developed Italian sonnet the rule of a change of rhyme and a break in sense between octave and sestet is absolute: the octave is broken into two quatrains with inner and outer rhymes, *abba*

abba; in the sestet a third rhyme sound is generally introduced, and the sounds are variously arranged, *cde edc* and *cde cde* being the favourite formulas. A final couplet, such as *cd cd ee*, is barred. But in the Shakespearean model the lines fall into three quatrains and a closing couplet, *ab ab, cd cd, efef, gg*; and in the Miltonic, while the Italian rhyme arrangement is preserved, the transition of thought and rhythm between octave and sestet is neglected. Spiritually, the narrow limits of the sonnet mark it out as essentially the expression of a single mood. This may either include a swell and reflux, like the Italian sonnet, or may advance in the gradual progress of three quatrains and break upon the shore in the final crash of the closing couplet, as in the Shakespearean sonnet. In any case, the elaboration of the form brings it within the definition of elegiac poetry, which is the expression of thought coloured with emotion, rather than that of lyric poetry, which is the expression of pure emotion. Collections.—Tottel's *Miscellany* (Wyatt and Surrey, 1557; ed. Arber, 1870); M. F. Crow's *Elizabethan Sonnet-Cycles* (1896); Arber-Lee's *Elizabethan Sonnets* (*English Garner*, 1903); A. Dyce's *Specimens of English Sonnets* (1833); Leigh Hunt and S. Lee's *The Book of the Sonnet* (1867); J. Dennis's *English Sonnets* (1873); D. M. Main's *A Treasury of English Sonnets* (1880); S. Waddington's *English Sonnets by Living Writers* (1881) and *English Sonnets by Poets of the Past* (1882); T. H. Caine's *Sonnets of Three Centuries* (1882); W. Sharp's *Sonnets of this Century* (1886); B. Nichol's *A Little Book of English Sonnets* (1903). See C. Tomlinson's *The Sonnet: Its Origin, Structure, and Place in Poetry* (1874); K. Lentzner's *Ueber des Sonett und seine Gestaltung in der Englischen Dichtung bis Milton* (1886); J. Schipper's *Neuenglische Metrik* (1888).

Sonnino, BARON SIDNEY (1847), Italian statesman, born at Pisa; entered Parliament in 1880; was minister of finance (Dec. 1893 to April 1894), and minister of the treasury (April 1894 to March 1896), and has done much to restore equilibrium and stability to Italian finance. A journalist for some years, he edited the *Rassegna Settimanale* (1878–82), and has contributed to the *Nuova Antologia*. He wrote a volume, *Contadini in Sicilia* (1876).

Sonora, N.W. state of Mexico, bounded by the United States on the N., and Gulf of California on the W.; covers 76,922 sq. m., and has silver mines. Lead, gold, and copper are also found. Cereals, tobacco, cotton, and sugar-

cane are produced. The capital is Hermosillo; the seaport, Guaymas. Pop. (1900) 221,682.

Sonpat, munic. tn., Delhi dist., Punjab, India, 27 m. N.N.W. of Delhi. Interesting Pathan tombs are in the neighbourhood. Pop. (1901) 12,900.

Sontag, HENRIETTA, COUNTESS ROSSI (1806–54), German singer, born at Koblenz. She made her début at Prague, at the age of fifteen, in Boieldieu's *Jean de Paris*. She afterwards appeared with great success in Berlin, Paris, and London. She married an Italian nobleman in 1828, and retired from the stage in 1830, but reappeared (1849) at Her Majesty's Theatre, London, and in 1853 went to the United States.

Sontai, tn., cap of prov. Sontai, Tong-king, French Indo-China, on r. bk. of Song-koi, and at head of delta, 22 m. W.N.W. of Hanoi. Its citadel is one of the finest in Tong-king. Pop. 10,000.

Sonthals, or SANTALS, form the most numerous branch of the Kolarian race (see KOLARIANS), occupying an extensive territory in Baghalpur, on the right bank of the lower Ganges north-west of Murshedabad. There are several sub-groups, such as the Marlis, Sarans, Murmus, and Karwars, numbering collectively 1,790,000 (1901 census), and all speaking dialects of Santali, which is the best known, the most highly inflected, and most important of all the Kolarian tongues. It has been reduced to written form by the Protestant missionaries, whose propaganda has been more successful amongst the Sonthals than amongst any of the other Indian aborigines. The type is somewhat negroid, with almost round face, large mouth, tumid lips, short nose, rather prominent cheek bones, very dark skin, coarse black hair, robust constitution showing a remarkable immunity from malarial fever. The grossest superstitions still survive amongst the pagan tribes.

Soochow. See SU-CHAU.

Sooloo. See SULU.

Soot, the black carbonaceous solid deposited as a result of the imperfect combustion of bituminous coal, wood, oil, and so forth. Besides its chief component, carbon, it contains some hydrocarbons; if derived from coal, it has also about 4 per cent. of ammonium sulphate, and is thus of some use as a manure. The finer kinds of soot, from oil and resin, are used as a pigment under the name of lampblack.

Sophia. See SORIA.

Sophia, ELECTRESS OF HANOVER (1630–1714), daughter of the elector palatine, Frederick v., and Elizabeth, queen of Bohemia, daughter of James I. of England.

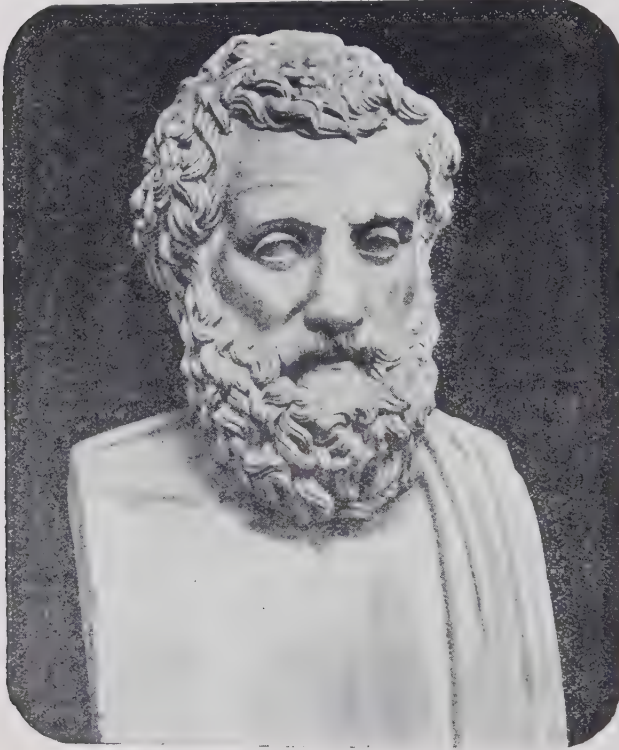
She married (1658) Ernest Augustus, Duke of Brunswick-Lüneburg, who became (1679) duke and (1692) elector of Hanover. As granddaughter of James I., the succession to the throne of England became (1701) vested in her and her heirs, and her eldest son, George, became George I. (1714). Her *Letters* have been published (1885-8), and her *Memoirs* (1879; Eng. trans. 1888). See A. W. Ward's *Sophia the Electress* (1903).

Sophia, SAINT, a concrete representation of Holy Wisdom, an

Platonic dialogues. But it has been shown by Grote that this view puts the sophists and their work in quite a false light. In the first place, they were not a school or sect, and had no recognized or common type of philosophical doctrine. They were really a class of teachers or popular lecturers, who sprang up in consequence of a demand for a certain kind of culture, especially in the art of public speaking. A number of the sophists further professed to add instruction in the art of conduct. But not

profession of the sophist tended to deteriorate, and the fact that they taught for pay, and made a livelihood by their teaching, did not at any time commend them to Greek feeling. See Grote's *Hist. of Greece*, vol. viii.; and papers by Sidgwick, reprinted in his *Philosophy of Kant* (1905).

Sophocles (497-406 or 405 B.C.), Athenian tragedian, was a native of Colonus, near Athens. He was famous for his personal beauty, his amiable character, his political qualities, and his pre-eminent poetical genius. He was elected one of the chief officers of the state in 440 B.C.; in 436 he was treasurer of the fund contributed by the allies of Athens. Some authorities have held that he was one of ten commissioners appointed in the crisis after the failure of the Sicilian expedition in 413 B.C.; but most likely the Sophocles mentioned was a different person. There is a story, not likely to be true, that in the last years of his life his son prosecuted him on the ground of incapacity to manage his property, and that he defended himself simply by reciting in court a famous chorus from his *Œdipus Coloneus* (produced after his death). On the occasion of his first appearance as a dramatist (468 B.C.) he won the first prize, defeating even Æschylus; on eighteen other occasions he won the first prize at the city Dionysia, besides others at the Lenææ; he was never lower than second. But only seven of his plays are extant, in addition to a number of fragments. He introduced a third actor, thus making the actors, not the chorus, the chief element in drama; he ceased to compose plays in trilogies (three plays dealing with one subject); he probably invented scene-painting; and was the first to use Phrygian music. Though he did not act in his own plays, he trained his actors and chorus, and composed his own music, as indeed all Greek dramatists did. He differed from Æschylus in bringing tragedy down to a human level; his characters, though rather types than individuals, are genuine men and women; their sufferings result from their own sins and mistakes, not from Nemesis or the workings of a divine curse; his female characters are much more important than those of Æschylus. He has not the latter's deep religious fervour, though he has a firm belief in the accepted religion and in the gods; but he holds that their ways are past man's understanding. In his general style and language he exhibits the perfection of tragedy, both in his dialogue and in his lyrical passages. It has not the lofty magnificence of Æschylus at his best,



Bust of Sophocles. In the National Museum, Naples.

abstraction denoting the All-Wise, or the idea of transcendental wisdom. Many Greek churches are dedicated to it, the most famous being that at Constantinople, built by Justinian (538-568 A.D.).

Sophists, a class of teachers of rhetoric and the art of conduct, who flourished in Greece in the latter half of the 5th century B.C. The traditional view of the sophists was that they were a school or sect of thinkers characterized by intellectual scepticism and ethical egoism, and as such they are represented in the

merely is it a mistake to attribute the sceptical doctrines professed by a few leading sophists to the rest, but it is open to question how far any real philosophical importance is to be attached to the apparent scepticism of these leaders themselves, of whom Protagoras and Gorgias are the best known. The distinction, to which some of the sophists gave currency, between the 'natural' and the 'conventional' in laws and conduct, is quite as susceptible of a positive as of a negative interpretation. It is true, however, that the

or the simplicity and naturalness of Euripides; but it avoids the bombast of the former and the homeliness of the latter. It has, in fact, the artistic restraint of the best Greek work, and may be compared to the sculpture of Phidias and the architecture of Ictinus and Callicrates, his contemporaries. His best plays are distinguished by the perfection of their plots; the *Œdipus Tyrannus*, in particular, is taken by Aristotle as a model of dramatic construction. His characters are delineated with great skill. In more than one instance, when dealing with the same myth as Æschylus or Euripides, he introduces a new personage, whose

Trachiniae. Editions—Text; Dindorf-Mekler (1885); with Latin notes, Wunder-Wecklein; German notes, Schneidewin-Nauack; English notes, Jebb (1885-96). English trans., verse, Whitelaw (1883) and Campbell (1883); prose, in Jebb's edition and Campbell's.

Sophonisba, a daughter of the Carthaginian general Hasdrubal, son of Gisco. She was married to Syphax, prince of Numidia, in 206 B.C. But in 203 Syphax was defeated and captured by his rival Masinissa, who also took his capital, Cirta, and with it Sophonisba, whom he at once married. But Scipio, fearing her influence over him, demanded her surrender. To save her from this

its classification is determined more by its quality than by its compass. The mezzo-soprano voice has a lower range than the soprano; but the former is frequently of extensive compass, and when so may be able to sing as high as, or even higher than, many true sopranos. See VOICE.

Sora, tn. and episc. see, prov. Caserta, Italy, on r. bk. of Liri, 19 m. N.W. of Cassino, surrounded by ruins of an ancient fortress. The principal products are wine, paper, and cloth. Pop. (1901) 16,022.

Sorata. See ANDES.

Sorau, tn., Prussia, 55 m. by rail S.E. of Frankfort-on-Oder. There are an old castle (1207),



College of the Sorbonne, Paris.

presence in the action aids the development of character. Contrast is used by him for a similar purpose; thus Antigone is opposed to her weaker sister Ismene, and Electra to Chrysothemis. A device much used by him, often with a very impressive effect, is his so-called 'irony,' by which is meant the use by one speaker in a dialogue of words understood in one sense by his interlocutor, and in another by himself and the audience, or by the audience alone. The verdict of his contemporaries, that he was the greatest of the three great tragic poets, has never been seriously questioned. His extant plays are the *Antigone*, *Ajax*, *Electra*, *Œdipus Tyrannus*, *Œdipus Coloneus*, *Philoctetes*, and

Masinissa sent her poison, which she drank without hesitation.

Sophon, a writer of mimes, was a native of Syracuse in Sicily, who flourished about the middle of the 5th century B.C. Mimes were compositions usually of a humorous character, intended to be acted, and connected in origin with the worship and festivals of Dionysus. The importance of Sophron lies in the influence he had in the development of Attic comedy, and in his being the model both of Plato in his dialogues and of Theocritus in his idylls. Only a few fragments remain.

Soprano, the highest species of singing voice. In the adult it is only possessed by women, and

used as a prison, and a new castle (1716), used as municipal offices. It manufactures machinery, glass, porcelain, and pottery. Pop. (1900) 15,945.

Sorb, a name sometimes given to the wild service tree.

Sorbonne, COLLEGE OF, was founded in 1253 at Paris by Robert de Sorbon (1201-74), chaplain of Louis IX. (Saint Louis). At first it was merely a home for students and teachers, but it soon developed into a seat of learning, whose special work was scholastic theology; and so great did its authority grow that even the *curia Romana* submitted difficult cases of conscience for its decision. The Sorbonne was powerfully influenced by the re-

naissance; it gave warm support to the establishment of the printing-press in Paris, and played an important part in the controversies of the 16th century. The theological faculty of the University of Paris held its sittings in the buildings of the Sorbonne, and the name of 'the Sorbonne' is therefore often, but erroneously, given to the faculty. Richelieu, who was afterwards buried in its chapel, reconstructed its buildings (1635-53), and after his time its authority seemed to rival that of the University of Paris. During the 18th century the Sorbonne threw its influence on the Gallican and Jansenist side of the religious controversies, and advocated the union of the Catholic and Greek Churches. It was, however, destroyed during the revolution (August 1792), and the real Sorbonne has never been restored. But between 1816 and 1821 the faculties of theology, science, and letters of the university were transferred to the buildings of the Sorbonne, and the university library (nearly 300,000 vols.) was also established there. New buildings were erected in 1885-1900. The faculty of theology was removed in 1885; but the *École des Chartes* was established there in 1897. At the end of the 19th century the Sorbonne possessed more than a hundred professorial chairs and more than ten thousand students. See Méric's *La Sorbonne et son Fondateur* (1888).

Sorcery. See MAGIC, WITCH-CRAFT.

Sordello (c. 1200-c. 1270), Italian troubadour, who wrote in Provençal, was born at Goito, near Mantua, and entered the service of Ezzelino III. and Alberico da Romano. About 1229 he fled to France, where he became a retainer of Charles of Anjou. Some thirty of Sordello's love songs are preserved; but these are surpassed in value and interest by the political poems, notably by the *planch* on the death of the patron of the troubadours, Blacatz. Dante assigns to Sordello an honourable position in his *Purgatorio* (vi. *et seq.*). All his pieces have been admirably edited, with Life, in Italian, by C. de Lollis (1896). See, too, E. Benson's *Sordello and Cunizza* (1903). Browning has a poem on Sordello (1840).

Sordes, in medicine, crusts which form upon the lips of sick persons suffering from extreme exhaustion. They are associated particularly with typhoid fever, and with what is known as the typhoid state, which may occur through exhaustion after other high temperatures, as in pneumonia, smallpox, typhus. They are formed from debris of food and epithelial scales, and are

due to lack of saliva and cessation of the usual lip movements. The sufferer's comfort is increased by sponging with warm, weak antiseptic lotions.

Sorel, tn., Canada, prov. of Quebec, at mouth of Richelieu, 45 m. N.E. of Montreal; was for many years the summer residence of the governors-general of Canada. Pop. (1901) 7,057.

Soresina, tn., Lombardy, N. Italy, 16 m. by rail N.W. of Cremona; has silk mills. Pop. (1901) 10,358.

Sore Throat means usually a catarrh of the tonsillar and the pharyngeal mucous membranes. It may be a manifestation of general diseases such as scarlatina and syphilis, or it may be due to local infection, as in erysipelas and diphtheria. Most commonly, however, sore throat is caused by an acute or chronic catarrh of less grave significance. Rheumatic and gouty patients are frequently subject to a catarrhal throat condition, which causes intense discomfort without being serious. Others are liable to successive attacks of tonsillitis of a more or less acute character. In some the uvula is the chief seat of trouble, and its swelling and elongation may be the principal source of the discomfort. In others the vocal cords suffer from undue exertion or from undue irritation. Again, sore throat may be due to the larynx becoming the seat of tubercular ulceration. Usually sore throat is merely a part of an inflammatory process which affects all the upper part of the respiratory tract. When the condition is due to erysipelas, scarlatina, diphtheria, or syphilis, local applications of antiseptics are necessary. Suppuration in the tonsils calls for early evacuation. An elongated uvula may require to be amputated. Rheumatic and gouty inflammations are often best treated by general measures aimed at the diathetic condition. Clergyman's sore throat demands continued rest, and a smoker may have to forego tobacco. Gargles of tannin and glycerin, of alum, of ferric chloride, of dilute carbolic acid do good in certain cases. Sprays of menthol, eucalyptus, thymol, and cocaine relieve the irritation; insufflations of potassium chlorate or of borax and inhalations of steam or of benzoin are all of service, but no one drug can be named as a specific for sore throat. In many cases guaiacum given internally cuts the inflammatory process short, especially if a rheumatic element be present, and in similar cases sodium salicylate, quinine, and opium are of service. Counter-irritation may also be employed by means of mustard poultices

or blisters over the tonsils, and by hot fomentations and compresses around the throat.

Sorghum, a genus of grasses, natives of the warmer parts of the globe. *S. vulgare*, the Indian millet, is important from an economic point of view. The other species, *S. halepense*, a native of the south of Europe, does well in ordinary garden soil in Britain, and is worth cultivating for its handsome leaves and branched purplish inflorescence. See DURRA and MILLET.

Sori. See FERN.

Soria. (1.) Province, Spain, is a cold mountainous district between the valleys of the Ebro and the Douro; the latter river rises here. Products, agricultural and timber. Area, 3,983 sq. m. Pop. (1900) 150,462. (2.) City, cap. of prov. of same name, Spain, on l. bk. of Douro, 81 m. W.N.W. of Saragossa, and 4 m. S. of the Ibero-Roman capital of Numantia. It has leather and cloth industries. Pop. (1900) 7,296.

Soricidae. See SHREW.

Sorø, tn., Denmark, isl. of Sjælland, 43 m. S.W. of Copenhagen, with a famous academy, founded 1586; reorganized 1822. In the (restored) church are the tombs of many Danish kings, and of the dramatist Holberg. Pop. (1900) 2,241.

Soroki, tn., Bessarabia gov., S.W. Russia, 82 m. N.N.W. of Kishinev, on the Dniester. It consists of three 'towns'—Jewish, Russian, and Moldavian. It has vineyards, grows tobacco, produces saltpetre, and is a river port. Pop. (1897) 15,800.

Soron, munic. tn., Etah dist., United Provinces, India, 53 m. S.W. of Bareilly, and on Ganges. The waters of the Burhanga attract pilgrims. Pop. (1901) 12,175.

Sorrel, a name applied to several plants, mostly natives of Britain. The common sorrel (*Rumex acetosa*) is a meadow plant, slender in habit, with juicy, acid-flavoured leaves, and bearing whorled spikes of greenish-red flowers in summer. Sheep's sorrel (*R. acetosella*) is a smaller plant, common in dry places. The mountain sorrel (*Oxyria reniformis*) is commonly found in damp places on high hills. It has kidney-shaped leaves, and bears spikes of greenish flowers in summer. The common wood sorrel (*Oxalis acetosella*) bears delicate ternate leaves, which fold together at night, and fragile white flowers in late spring. The common sorrel and certain other species are often grown in gardens, doing best in rich, deep, moist soil. The leaves are used as a substitute for spinach.

Sorrel Tree, a small tree (*Oxydendron arboreum*), a native of the Alleghanies. It belongs

to the order Ericaceae. The popular name is derived from the acidity of the leaves.



Common Sorrel (*Rumex acetosa*).

1, Female flower spike; 2, fruit; 3, female flower; 4, male flower.

Sorrento, tn. and summer resort, prov. Naples, Italy, 17 m. S.S.E. of Naples across the bay, on a rocky promontory. It is the seat of an archbishop, and is the centre of a wine-growing district. The poet Tasso was born here. Pop. (1901) 8,832.

Sortes Virgilianæ, or the VIRGILIAN ORACLE, was the name given to that form of divination which consisted in opening a particular book at random, and regarding as a prophecy the lines on which the eye first fell or on which the finger happened to be placed. Prior to their destruction in 82 B.C., the Sibylline books were so consulted by the Romans. Thereafter Virgil's *Aeneid* became the favourite—although not the only—oracle of this kind; whence arose the term *sortes Virgilianæ*. St. Augustine (4th century) and Gregory of Tours (6th century) both appealed to the Bible in this way; while the career of St. Anthony (3rd century) was settled by the words that a deacon chanced to read out as he was entering the church. Nevertheless the practice was prohibited by the councils of Vannes (461 A.D.), of Agde (506 A.D.), and of Auxerre (585 A.D.); and Pope Gregory II. and Charlemagne both pronounced against it. Yet the custom has never actually died out. This use of the Scrip-

tures is illustrated in Tennyson's *Enoch Arden*, and readers of Scott will remember another instance in *Woodstock*. Among the Mohammedans the Koran and the poems of Hafiz are alike regarded as *sortes sacre*.

Soteriology, that division of dogmatic theology which sets forth the doctrine of salvation by Jesus Christ. See ATONEMENT.

Sotheby's, the principal book-auction room in Britain, was founded in 1744 by Samuel Baker, bookseller and auctioneer. The present style is Sotheby, Wilkinson, and Hodge, of Wellington Street, Strand, London. The first auction was held on Jan. 7, 1744. A century and a half later a sale occupying one day, and comprising but 132 lots, realized £5,524 (Ellis, Nov. 4, 1901). Richard Heber's collection was sold here in 1834, and brought £57,000. The books of Henry Perkins realized nearly £26,000 in 1873. The Beckford library was sold during 1881-4, and resulted in a total of £73,551. The printed books of the Duke of Hamilton, who came into possession of the Beckford library through his wife, realized £12,892 (1884), and 91 lots of his MSS., the property of the German government, to whom the whole collection had been sold by Sotheby & Co. for the duke, brought £15,189 (1889). Sir John Thorold's library brought a total of £28,000 (1884). The two portions of the Earl of Crawford's books sold for £26,397 in 1887-9. A sum of £22,312 was obtained for the Gibson-Craig library (1887-8). Mr. W. H. Crawford's books realized £21,255 in 1891. The famous books, and 'Appendix' and 'Barrois' MSS., collected by the first Earl of Ashburnham, were sold during 1897-1901, and realized £104,423. A portion of William Morris's books and MSS. brought £10,992 in 1898. Sir W. Fraser's library realized £20,334 (1901), and the Hibbert library £12,097 (1902). Though the sale of books constitutes the principal business at Sotheby's, prints, coins, and antiquities are also disposed of. The most extensive numismatical sale was that of the Montagu collection, which resulted in a total of nearly £40,000 (1896-8). The Egyptian antiquities of W. H. Forman realized £25,825 (1899-1900).

Sothorn, EDWARD ASKEW (1826-81), English comedian, was born in Liverpool, and entered the stock company of the Birmingham Theatre Royal. In 1858 he appeared in a minor rôle as Lord Dundreary in *Our American Cousin*, and gradually created the part till the play became little more than Dundreary monologues. In 1861 he introduced the part in London, and made a great

hit. Sothorn had always a great ambition to play tragedy, but he was essentially a comedian. David Garrick in Robertson's play is perhaps his best part after Lord Dundreary. See *Memoir* by Pemberton (1890).—His son, Lytton Edward (1856), is also an actor, and first appeared (1872) as Captain Vernon in *Our American Cousin*. He has toured in the United States and Australasia. He played in *Crutch and Toothpick* at the Royalty (1879), and later in *Betsy* at the Criterion, since when he has been starring in America with his own company.—Edward H. (1859), second son of E. A. Sothorn, is well known as an American actor. His greatest successes have been in *Our Girls* at the Lyceum, New York (1885), *The Highest Bidder* (1887), and *Hamlet* (1900). His wife is Virginia Harned, the actress.

Soto, FERNANDO DE. See DE SOTO.

Sottenville - lès - Rouen, tn., dep. Seine-Inférieure, France, 1 m. S. of Rouen, of which it is a suburb; has cotton-spinning and manufactures of calico. Pop. (1901) 18,535.

Soubise, a Huguenot family. HENRI, DUC DE ROHAN, and his brother BENJAMIN DE ROHAN (1583-1642), seigneur of Soubise, were both Huguenot leaders. Benjamin served under Prince Maurice in the Low Countries, and commanded the Huguenots during the religious war in Poitou, Anjou, and Brittany (1621-5). He finally retired to England, where he died.—CHARLES DE ROHAN, PRINCE DE SOUBISE (1715-87), marshal of France. In the Seven Years' war he was in command on the lower Rhine, but at Rossbach he was routed by Frederick the Great in 1757. He was a favourite of Louis XV., or rather of his mistresses, Pompadour and Dubarry. He was the only courtier who accompanied the body of his king to the grave.

Soudan. See SUDAN.

Soul. It was not until the time of Plato that the distinction between soul (or mind) and matter, together with the immaterial nature of the former, was clearly established. The pre-Socratic philosophers had no real conception of an immaterial principle. Heraclitus, for instance, conceived the soul as composed of the element fire, in terms of which he sought to explain all the phenomena of the ever-changing world. In Plato's sharply-marked dualism between the ideal and the sensible world the soul, as apprehending the immaterial ideas, comes itself to be conceived as immaterial; and since the ideas are removed above all change and destruction, the soul

too, through its kinship with them, comes to be endowed with immortality. Whether such immortality would, apart from religious motives, have amounted to what we mean by the term is doubtful, and certainly his great disciple Aristotle did not admit the conception of a personal life after death. With Aristotle the soul is simply the vital principle, distinguished in man by the characteristic of rationality. In Christian theology the moral personality of the individual and its continuance after death become, of course, much more strongly accentuated; but along with this there goes for a time that quasi-materialistic conception of the soul which it has always taken much effort of thought to transcend. At the outset of modern philosophy the distinction between mind and matter, the *res cogitans* and the *res extensa*, was made by Descartes so radical and complete that the difficulty for philosophy came to be not that of recognizing the distinction, but that of discovering how two such diametrical opposites could come together to constitute a single world at all. And since Descartes's time the distinction has been an accepted philosophical truth. Not that it has never been questioned; for scientific materialism has flourished both in the 18th and in the 19th century. That mind or soul is immaterial is beyond question; but whether we should say, like Descartes, that it is an immaterial substance is another question. Philosophical thought at the present day is divided between the theories of interaction and parallelism. According to the former theory, soul and body mutually affect each other as cause and effect, and this is, of course, the natural view to take of the obvious facts of sensation and movement. But it is not a view which is easily adapted to scientific purposes. The physiologist wants to represent the series of nervous changes from incoming stimulation through brain centres, and thence to outgoing movement, as continuous. And, again, the admission of mental causes and effects of physical changes seems to make havoc of the conservation of physical energy. For such reasons the theory of parallelism, according to which mental and cerebral changes are strictly correlated, but without mutual interference, is preferred by the majority of physiologists and psychologists. On the other hand, it is difficult, if not impossible, to put this theory into any satisfactory philosophical shape. (See criticism in Ward's *Naturalism and Agnosticism*, 1903, vol. ii.) An excellent general account

of the whole subject is given in Stout's *Manual of Psychology* (1899). See **PSYCHOLOGY**.

Soul, SEOUL, or HAN-YANG, tn., cap. of Korea since 1392, 3 m. from r. bk. of Han R. and 75 m. from its mouth. The city walls are from 20 to 30 ft. high, with a circuit of 12 m. It is in railway communication with Chemulpo (25 m.). It is a miserably built place; but there are a Roman Catholic cathedral, a bell tower (1468), and a marble pagoda. Since 1904 the city has been under the control of the Japanese. Pop. (1902) 196,646.

Soulary, JOSÉPHIN, properly JOSEPH MARIE (1815-91), French poet, born and died at Lyons, where his Genoese ancestors, the Solari, introduced a velvet industry. His *Sonnets Humoristiques* (1858), graceful, elegant, accurate in style and form, though not of the first order of poetry, are admirable literary miniatures—e.g. *Les Deux Cortèges*. In 1871 he wrote war songs (*Pendant l'Invasion*), composed also two comedies, and (1886) *Promenade autour d'un Tiroir*. Other works are *Ephémères* (1846 and 1857), *Sonnets, Poèmes, et Poésies* (1864), *Rimes Ironiques* (1877). See Monograph in French by Mariéton (1884).

Soult, NICOLAS JEAN DE DIEU (1769-1851), marshal of France, was born at St. Amans-la-Bastide (Tarn), and in 1785 enlisted as a private soldier in the French army. Becoming general of brigade in 1794, he distinguished himself in Germany, especially at Altenkirchen (1796) and Stockach (1799). Masséna made him general of division in 1799, and he ably supported that commander in Switzerland and Italy. In 1804 Napoleon made him a marshal, and in 1807 Duke of Dalmatia, he having further distinguished himself at Austerlitz and in Prussia. In 1808 he was put in command in S. Spain, fought the battle of Corunna, overran Portugal, defeated the Spaniards at Ocaña (1809), and subdued Andalusia, but was defeated at Talavera (1809) and at Albuera (1811). Sent to hold Wellington in check, he suffered further defeats at Salamanca, Orthez, and Toulouse (1814), but accomplished his mission in great part. After Waterloo he was banished from France (1816-19). He was, however, minister of war (1814-15, 1830-4, 1840-4), minister of foreign affairs (1839-40), and president of the cabinet (1832-4, 1839-47). In 1847 the rare dignity of marshal-general of France was conferred upon him. See his *Mémoires* (1854); Combes's *Histoire Anecdote de Jean de Dieu Soult* (1870); and Salle's *Vie Politique de Maréchal Soult* (1834).

Sound, in ordinary language, is what we recognize by our sense of hearing. We learn by experience to associate the production of sound with a definite source, which is invariably a body in a state of more or less rapid vibration. The investigation and discussion of the way in which this vibration is started and maintained, and the way it is transferred to the air and transmitted through it as a disturbance capable of affecting our ear, constitute the branch of physical science known as sound. From one point of view the theory of sound forms a chapter in the general dynamic theory of elasticity, since its production and transmission depend upon the elasticity of matter in all states. The elasticity may be an essential property of the matter, as in the case of a tuning-fork, a cymbal, a bell, or the column of air in an organ pipe; or it may be an accidental property of the body, as in the case of the stretched strings of the harp, violin, or piano, or the stretched skin of a drum.

The ear recognizes a great variety of sounds, and can generally associate a definite kind of source with each sound heard. Not only so, but it can in many cases distinguish between the sounds given forth by two different sources of the same kind—such, for example, as the sounds of two voices. To this difference in quality as recognized by the ear there must correspond some difference in the character of the vibration as transmitted through the air. It is one important aim of physical science to investigate this difference. Another familiar difference between two sounds is the difference in pitch, the difference between what is called a high musical note and a low musical note. It is on this characteristic, indeed, that the whole theory and practice of music is based. A third characteristic of sounds is their loudness or intensity, which must obviously depend upon the rate at which the disturbance is losing energy as it affects the organs of hearing. If we assume that a certain definite fraction of the whole energy present is used up in producing the sensation, then we find that the intensity of a sound as heard by us is proportional to the energy of the vibratory motion—a relation probably fairly well satisfied.

These three characteristics—intensity, pitch, and quality—correspond each to some definite physical property of the aerial disturbance which gives rise to the sound. The essential nature of these is suggested by a study of the manner in which the sound is produced. Pitch depends upon the rate at which a series of simi-

lar disturbances occurring at regular intervals falls upon our ear. The ear is not able to distinguish the individual disturbances when these come at a rate of about 25 per second; but not till the number is well over 30 per second does the pitch of the note become musically definite. The number of vibrations in a second is called the 'frequency' of the note. Hence the pitch of a note is determined by its frequency.

By whatever kind of vibrating body the pulsations are communicated to the air, the vibrations of the air can only be of one general type. They consist of alternations of greater and smaller density, and constitute in the medium waves of condensation and rarefaction. Similar waves are transmitted through water and fluids generally; but in solids waves of distortion also exist. When we speak of sound travelling through other media than air, we mean waves of disturbances such that, when they pass into the air, they possess frequencies enabling them to be heard as sound—i.e. from 30 to about 40,000 vibrations per second. The upper limit is very variable according to the individual, some ears being capable of hearing high-pitched notes inaudible to other ears. It is highly probable also that the range of audibility differs in different kinds of animals.

The energy of the original vibratory motion determines the energy transmitted to the air, and this in its turn determines the intensity of sound heard. Thus we may say generally that pitch depends on the frequency, and intensity on the magnitude, of the disturbance.

Quality then must depend on some other characteristic of wave motion, and the remaining characteristic is the form of the wave. To produce a pure musical note the successive disturbances must all be of the same form. For example, in a note whose frequency is, say, 200 per second, the period of one disturbance is the $\frac{1}{200}$ th of a second. In this short interval the pulse or disturbance goes through all its phases. At any one point the density and pressure vary in a definite assignable manner, which may, however, be different in different cases although the period is the same in all. It is this mode of variation within the period of the pulse which determines the form of the wave. The simplest discussion of the question is by means of the vibrations of stretched strings. When a stretched string is plucked at any point a wave is started, and it travels to and fro along it with a velocity which depends upon the tension in the string and its

weight per unit length. Now a wave passes forward through the distance known as its wave-length in an interval of time equal to the period of the wave disturbance. Hence speed of propagation is equal to the wave-length divided by the period. But the period is the reciprocal of the frequency, and thus speed = wave-length \times frequency. Now the longest wave which can be sent to and fro along a string with fixed ends is one whose wave-length is twice the length of the string. This longest wave will therefore vibrate with a frequency which is the lowest possible for this particular string of given weight and tension. The note corresponding to this lowest frequency is called the funda-

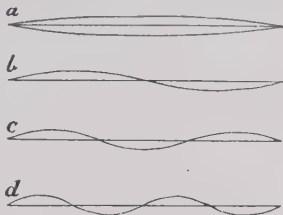


FIG. 1.

mental note of the string. The mode of vibration is indicated in Fig. 1, *a*. But the string may also be thrown into a mode of vibration like that indicated in *b* (Fig. 1). Here the wave-length of the wave passing to and fro along the string is half that of the longest possible wave-length. Hence its frequency will be double that of the fundamental note. Similarly we may have the string vibrating in three, four, five, or more segments (*c*, *d*, Fig. 1), corresponding to correspondingly shorter wave-lengths and correspondingly greater frequencies.

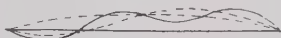


FIG. 2.

Thus, from any one string under constant tension we may get a series of notes whose frequencies are as the natural numbers 1, 2, 3, 4, 5, 6, etc., the practical limit being determined by the imperfect flexibility of the string. But not only may the string give all these notes separately; it may also give them as a combined body of tone of complex form built up of the simple components. The modes of vibration may, in fact, be superposed as indicated in Fig. 2 (where a possible combination of *a*, *b*, *c*, Fig. 1, is shown), and evidently this compound vibration will be transmitted to the air, producing a form of wave that depends on the

number and relative strengths of the component simple vibrations. It is, in fact, the presence of these overtones, or upper harmonics as they are called, which determines the quality of the tone produced. In the case of vibrating strings and vibrating columns of air (organ, flute, trumpet), the frequencies of the successive overtones are as the series of natural numbers; but this is not the case when the initial vibration is given by a vibrating reed, membrane, or plate. Overtones exist in these cases which are not harmonically related to the fundamental note. It is essential for musical purposes that the anharmonic overtones should not be very pronounced. They may be kept comparatively feeble by strengthening the fundamental tone by means of resonance.

The principle of resonance has been called the principle of sympathetic vibrations, and may be illustrated dynamically by means of two pendulums suspended from the same framework. When one of these pendulums is set in oscillation, it begins to influence the other, and to force upon it its own oscillation. But it is only when the natural period of oscillation of the second pendulum is equal to that of the first that this influence becomes strongly marked. In exactly the same way, and for exactly the same reason, one vibrating body, such as a tuning-fork, can set in vibration a neighbouring tuning-fork or stretched string which is tuned to the same note. A suitably-shaped air cavity placed near the tuning-fork will greatly increase the intensity of the note heard, the natural period of vibration of the mass of air in the cavity being equal to that of the tuning-fork. Reed pipes in organs are provided with pipes of lengths corresponding to the pitch of the note given by the vibrating reed. This note is reinforced by the resonance of the column of air in the pipe. In the ordinary organ pipe the blowing of the air past the lip sets the column of air in the pipe into its natural period of vibration, so that the pitch of the note is entirely determined by the size of the pipe.

In a violin the different notes are got from the strings by 'stopping' them to different lengths. But the strings vibrating by themselves in air would not produce any body of tone, being too thin to obtain sufficient grip upon the air. The hollow body of the violin acts as a resonance box to all the various notes given by the strings.

It is resonance, again, which determines not only the quality of a voice but also the character of the vowel sounds uttered. The

vibrations of the vocal cords are of a complex character, and by appropriate form of the mouth cavity the speaker emphasizes certain of the components. This selective reinforcement by means of resonance results in a corresponding vowel quality of tone. By a suitable synthesis of simple tones, given by a series of tuning-forks, Helmholtz was able to simulate the vowel sounds of the human voice.

Under the heading INTERFERENCE the phenomenon known as beats in sound has been discussed at some length. When two notes of nearly the same pitch are sounded together, a rise and fall in the intensity of the sound is heard, the number of maximum points in a second being equal to the difference of the frequencies. The ear is able to recognize this beating when the difference is less than 20; but when the difference of the frequencies is greater than 30 a new phenomenon presents itself. The difference of the frequencies becomes evident to the ear as a difference tone, whose frequency is this difference. Sound together, for example, the middle C and G upon an organ or a harmonium, the frequencies of which are on these tempered instruments very nearly as 2 to 3. (In the true accurately tuned fifth they would be exactly as these numbers.) At once the ear will hear a lower tone than either component, and the pitch of this tone will be an octave below the C, having a frequency equal to the difference of the frequencies of the C and G. This phenomenon was early recognized by organists, and is known as Tartini's beat. The obvious explanation was that it was due to the coalescence of the interference beats when these were too numerous to be individually recognized and frequent enough to form a tone of definite pitch. Helmholtz showed, however, that although this explanation might apply when the individual notes were powerful, it did not contain the complete explanation. He found that the difference tone was not increased in intensity when a resonator tuned to the same pitch was applied to the ear. Thus the difference tone was to a large extent produced in the ear itself; and he showed that this could be explained dynamically as being due to the asymmetric character of the vibrating part of the ear when it is acted upon by the two vibrations from without. This explanation also accounted for the summation tone heard under certain circumstances—a tone whose frequency is the sum of the frequencies of the component notes.

The transmission of sound through the air depends on the elasticity and density of the air. Newton was the first to show that the speed of propagation should be equal to the square root of the ratio of the elastic force to the density. Using Boyle's law, he calculated what the speed should be, and obtained a value fully one-tenth less than the observed value. The discrepancy was cleared up by Laplace. Since sound is propagated by a succession of condensations and rarefactions in the air, and since a sudden compression causes a rise of temperature and a rarefaction a fall of temperature, it is obvious that Boyle's law, which holds for constant temperature, does not apply. The heating during compression and the cooling during expansion increase the resistance of the air to being compressed and rarefied, and consequently the elastic force applicable to this case will be higher in value than that used by Newton. When the correct value is used, the calculated value of the speed of sound agrees with the observed value—namely, about 1,100 feet per second. So rapidly do the alternations of pressure and density take place that there is no time for the heat developed in the condensed part to diffuse into the colder region of the neighbouring rarefied part. The air, in fact, behaves very rigorously in an adiabatic manner. (See THERMODYNAMICS.) Stokes has shown that a very small loss or gain of heat by conduction or convection would quickly stifle any sound that was being propagated through the air. All elastic bodies can transmit waves of compression like the sound waves in air, and in the case of fluids the rate of propagation depends on the same dynamic constants—namely, the resistance to compression and the density. The density of water is much greater than that of air; but on the other hand, water has a very much greater resistance to compression. Thus the velocity of the compressional wave in water is nearly five times the velocity of sound in air.

Elastic waves somewhat analogous to sound waves in air may also be transmitted through solids; and here again the speed depends upon a certain elastic constant and the density. This kind of motion must be distinguished from the body vibrations by which sounds are produced in such instruments as drums, tuning-forks, cymbals, and bells. Homogeneous isotropic solids have two kinds of elasticity, and corresponding to these are two kinds of waves, each travelling with its own velocity. When these emerge at the surface of

the solid, they may be continued through the air as audible waves of compression—that is, as sound waves. In this sense, and in this sense only, can we speak of solids conveying sound. Rayleigh has shown that solids may transmit a third kind of elastic wave—namely, a wave whose disturbance penetrates a very short distance below the surface. This also may obviously give rise to sound waves in air if the vertical motion is sufficiently great and sufficiently rapid. See EARTHQUAKES.

Being wave motion, sound is capable of reflection and refraction at the boundary of two media differing in density and elasticity. Echoes and the phenomena of whispering galleries are familiar illustrations of reflection. Sound may be refracted through a lens of carbonic acid gas; and under certain conditions of the atmosphere sound is bent upwards into the higher regions of the air. This is due to change of temperature. A change of density at constant temperature is accompanied by a proportionate change in the resistance to compression, so that the speed of sound in air, being determined by the ratio of these two quantities, is the same at all densities provided the temperature is constant. Diffraction of sound may also be observed under suitable conditions, which have been lucidly described by Lord Rayleigh in his Royal Institution lecture of 1888. (See his collected *Scientific Papers*, vol. iii.) The phenomena cannot well be shown with ordinary sound waves, because of the length of the waves in comparison with the apertures through which the sound passes or the objects which throw the sound shadows. By means of sensitive flames, which respond to aerial vibrations of frequencies so great as to be inaudible, Rayleigh was able to demonstrate the existence of diffraction phenomena. The most complete treatise on sound is that by Rayleigh (2nd ed. 1894-6). Helmholtz's *Sensations of Tone* (Eng. trans. 1885) contains many remarkable discoveries. For a more elementary treatment, see Thomson and Poynting's *Text-book of Physics* (1903).

SOUND, BATTLE OF THE, was fought on Nov. 8, 1658, between a Dutch fleet and a Swedish fleet under Wrangel. The former completely defeated the Swedes and relieved Copenhagen.

SOUND, THE, strait connecting the Kattegat and the Baltic between Sweden and the island of Zealand, Denmark. It is 30 m. from N. to S., and between Helsingborg and Elsinore is only 3 m. wide. In 1348 the King of Den-

mark, who possessed both shores, agreed with the Hanseatic League to maintain lighthouses in the Sound and the Kattegat, on condition that the ships of the league paid duty. England and other countries agreed later, and tolls were levied up till 1857. The dues were then capitalized for £3,500,000, of which Great Britain paid one-third.

Sounding. See NAVIGATION, OCEAN.

Soup. Most soups contain such extractives of albuminates as are soluble in boiling water, and many have in addition a large proportion of albuminoid matter, such as gelatin. These extractives render soup a highly nutritious and stimulant food, easily digested and assimilated by those whose digestion is weak or impaired. Some have taken objection to the use of soup at the beginning of a meal, on the ground that the fluid dilutes the gastric juice unduly, and thus diminishes the digestive power. This may be the case with some dyspeptic patients, but not with most healthy individuals. A typical soup may be made from the neck, cheek, leg, or shin of beef, together with split peas, fresh vegetables, and onions. To extract the gelatin the bones should be broken in small pieces and simmered for some hours, and the meat should be cut into pieces about an inch square, and cooked at about 160° F. Dried peas should be soaked overnight and boiled gently, while the fresh vegetables ought to be cut small and boiled or steamed. The various ingredients may then be mingled and gently simmered till ready for use. For fever patients soup made from meat alone is often necessary, and even when vegetable juices are allowable the soup may require to be strained. When a patient suffers greatly from thirst, the soup may be given iced or in the form of a jelly; and a fruit soup, made by boiling fresh or dried fruits in water, and straining, is, both agreeable and useful in such cases.

Sousa, JOHN PHILIP (1856), American conductor and musical composer, was born at Washington, where he received his musical training. From 1880-92 he was conductor of the band of the United States Marine Corps, and in 1892 organized the Military Concert Band, known as Sousa's Band, with which he has since travelled all over Europe. His compositions comprise operas, orchestral suites, numerous marches, waltzes, and songs. Several of his marches, such as *The Washington Post* and *Stars and Stripes for Ever*, have achieved much popularity. His collection of *National, Patriotic,*

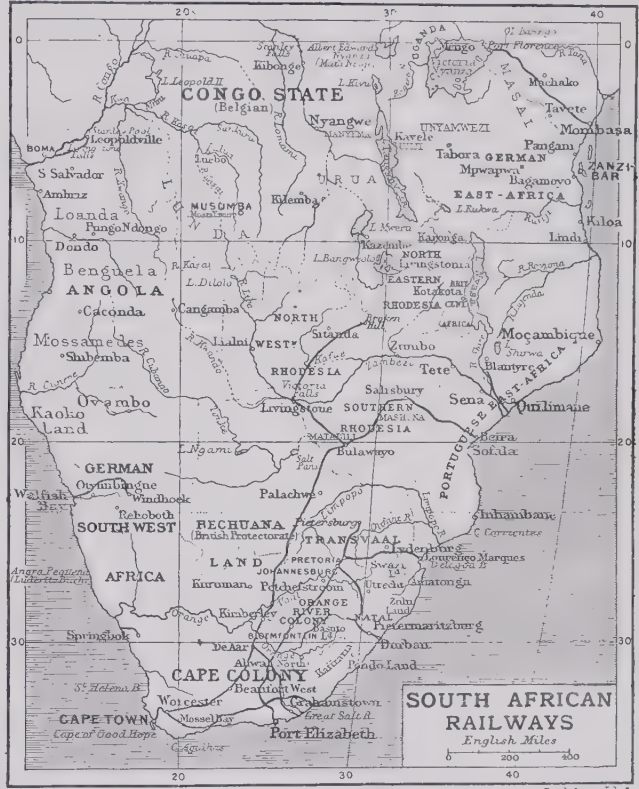
and Typical Airs of all Countries is in the collection of service bands throughout the civilized world.

South, SIR JAMES (1785-1867), English astronomer, was born near London. He was educated for the medical profession, but relinquished it and devoted himself entirely to astronomy, and was one of the founders of the Astronomical Society, and became its president in 1829. He was knighted in 1830.

South, ROBERT (1634-1716), English divine and pulpit orator,

a famous controversy on the Trinity with Sherlock, dean of St. Paul's. See *Works* (1823), and *Lake's Classic Preachers of English Church*.

South Africa. The British possessions in South Africa comprise Cape Colony, Natal, the Orange River Colony, the Transvaal, and the protectorates of Bechuanaland and Basutoland, with an aggregate area of about 865,000 sq. m., and a population of fully 5½ millions. To the north Rhodesia extends into the heart of the continent; but S. Rhodesia, bounded



was born at Hackney, London, and was a fellow-student with John Locke at Christ Church, Oxford. After the restoration he was appointed orator for the university, and by his oration at the installation of Clarendon as chancellor in 1661 secured that statesman as his friend and patron, and made his reputation as one of the foremost formal orators in English history. He was appointed private chaplain to Clarendon, and in 1663 prebendary of Westminster, canon of Christ Church (1670), and rector of Iship (1678). In 1693 he began

on the N. by the Zambezi, may be included in S. Africa. For further information see the separate colonies.

South African Company. See RHODES, C. J.; ZAMBEZIA.

South African Railways. Practically all the important railways in S. Africa are now owned by the government. The principal lines run from Cape Town to Vryburg (774 m.); Vryburg to Bulawayo (587 m.), owned by the Rhodesia Railways; Port Elizabeth to De Aar (339 m.); East London to Springfontein, Orange River Colony (314 m.);

Durban to Charlestown (304 m.); and Pretoria to Pietersburg. The total mileage owned by the Cape Colony government is 2,664 (1904), on the construction of which £27,704,204 has been expended. The total mileage owned by the Transvaal and the Orange River Colony is 1,540 (1904); 404 m. of new line are under construction, and 711 m. are projected. The total mileage owned and worked by the Natal government was 776 at December 1904, the total cost up to 1904 being £11,170,487.

South African Republic. See TRANSVAAL.

South African War, or **BOER WAR** (1899-1902), had its origin in the grievances of the Outlander (foreign) population, who were mostly British subjects, and who were refused their share of political rights, while they owned most of the property and had to bear the major part of the taxation. For five years an agitation had been going on with a view to securing equal rights for all white races in the Transvaal; but the Volksraad, guided by President Kruger, stubbornly resisted all proposals for reform. Ultimately the British subjects petitioned the imperial government to redress their wrongs, and several months of tedious negotiations followed. While the world was waiting for the proposals which the British government had undertaken to formulate for a settlement of the issues, an ultimatum was presented to the British agent at Pretoria, insisting that all the points in dispute should be settled by arbitration, and demanding that all reinforcements should be withdrawn and troops on their way to South Africa should be recalled. The Orange Free State, despite a guarantee that its territory and independence would be respected in the event of war, cast in its fortunes with the sister republic, and the British colonies were invaded (Oct. 10, 1899). The first shock of war fell upon a column of 4,000 men under General Penn Symons, part of the Ladysmith garrison of Natal, sent north by Sir George White to guard the railway at Dundee. Appearing suddenly upon Talana Hill on the morning of October 20, the Boers shelled the British camp, and so completely outranged their artillery that General Symons had no alternative but to carry the hill by assault, in which operation he himself was mortally wounded. Colonel Yule, who took over the command, that very night struck camp and retreated upon Ladysmith. On the day after Talana Hill, General French, with another force from Ladysmith, encountered a strongly posted body of the enemy at Elandslaagte under General

Koch, and routed them with great slaughter, capturing two guns and many prisoners, including the German artilleryman, Colonel Schiel. To keep the road open for Colonel Yule's retreating force, Sir George White engaged the Free State burghers on the west, and drove them from the hills about Rietfontein. These actions had no effect in delaying the advance of the Boers, who, commanded by General Joubert, continued to pour their main army over the border into Natal. General White, who had now 12,000 men, strove hard to ward off the impending blow. On October 30 he ordered a sortie, but it ended in disaster. This was the battle of Lombard's Kop, in which 1,000 men were surrounded at Nicolson's Nek and compelled to surrender. Three days later the investment of Ladysmith was complete, and for four months General White kept at bay the main army of the Boers.

Meanwhile the enemy had been active on the western and southern borders of the republics, and had laid siege to Kimberley and Mafeking. The former was defended by a garrison of about 4,000 civilians and military under Colonel Kekewich, and the latter by a handful of irregulars under Colonel Baden-Powell. Both held out until they were relieved—Kimberley on February 15, 1900, and Mafeking three months later, on May 17. The history of the war for some months centres in the efforts made to relieve the three beleaguered towns and to thrust the Boers back from Natal and Cape Colony.

On November 9 the first instalments of the greatest army ever sent across the seas by any nation in the world began to arrive at Cape Town, and when the force was large enough, three forward movements were made—one under General Sir Redvers Buller to the relief of Ladysmith, a second under Lord Methuen to the relief of Kimberley, and a third under Sir William Gatacre to meet a force marching south by Colesberg, Burghersdorp, and Aliwal North. For a time each of these columns met with failure, disaster, and defeat. Lord Methuen on his march to Kimberley came in touch with the Boers at Belmont (November 23) and Graspan (November 25), carried the ridges they held, and forced them to fall back. But on November 27 his way was barred by Commandant Cronje at Modder River, where Cronje made masterly dispositions. On the morning of November 28 Lord Methuen's army became involved in a desperate action on an open plain, where they could neither advance nor retire. The Boers, secure in

their trenches, poured a perfect tempest of bullets upon the British lines, and the men lay huddled upon the ground while shot and shell swept over them. Eventually General Pole-Carew's brigade succeeded in crossing the river and threatening the burghers' flank. During the night the Boers evacuated all their positions. After waiting for reinforcements, which brought his army up to 11,000 men, Lord Methuen renewed his efforts to crush the force which confronted him. Finding the Boers intrenched in a semicircle of hills at Magersfontein, on Sunday, December 11, he sent forward the Highland brigade under General Wauchope; but in the darkness it was mowed down before the men could extend. The column broke and fled, leaving their general and many dead upon the field, and the attack had ultimately to be abandoned.

On the night of December 9 General Gatacre set out from Molteno to surprise the Free Staters, who had taken up a strong position at Stormberg. But daylight broke before the enemy was reached, and the first hint of their presence was the crash of their rifles from a steep line of kopjes, which the British infantry gallantly assailed but were unable to climb. Nearly 100 officers and men were killed and wounded, while over 600 fell into the hands of the enemy.

In the same week, so full of misfortune that it came to be known as 'the black week,' another disaster fell upon the British army. General Sir Redvers Buller, who had assumed the command in Natal, advanced to attack the Boers, strongly intrenched at Colenso on the Tugela. He had with him about 20,000 men, and Sir George White in Ladysmith was ready to draw off the attention of a portion of the Boer army by making a sortie. Sir George was led to understand that no attack would be made till December 17, but, as it happened, the attack was made two days earlier. It was delivered across an open plain, with the river and the heights beyond. The Irish brigade under General Hart advanced in quarter column into a loop of the stream, where they were exposed to a heavy cross fire, and failed to discover the ford by which to get across. The English brigade under General Hildyard lost 200 men in attempting to cross at Colenso; and the disaster of the day was completed when, a portion of the artillery being brought within easy rifle range of the hostile trenches, the gunners were shot down and eight guns captured. Over 1,000 men were lost by the British in killed, wounded, and missing, including

the son of Lord Roberts, who was shot in a gallant attempt to rescue the guns. A profound impression was created in the country by the news of these disasters following so closely one upon another. Lord Roberts was at once appointed commander-in-chief in South Africa, with Lord Kitchener as chief of his staff; all the army reserve not already at the front were called up and sent to South Africa; offers of assistance came from the British colonies, and the same patriotic wave sweeping over the country resulted in the embodiment of a yeoman and volunteer force.

Elated by their success at Colenso, the Boers made a resolute attempt to capture Ladysmith. On January 6, under cover of darkness, they secured a footing on a ridge of hills which would have rendered the town untenable. A fierce struggle ensued for sixteen hours. The Boers three times seized the hill and as often were repulsed till, with a last desperate charge, the Devons drove them in headlong flight across the Klip River, and Ladysmith was saved. Three hundred and twenty of the garrison were killed and 500 wounded in this attack. On the 22nd General Buller attacked the Boers' main position on a precipitous height called Spion Kop, where a desperate encounter took place; but the position was abandoned when victory and an open road to Ladysmith lay within the British grasp. Still another attempt was made early in February; but the positions seized on the north side of the Tugela were found to be untenable and were again abandoned.

The arrival of Lord Roberts in South Africa changed the aspect of affairs. Up to this point the Boers had been assailed with frontal attacks, but the new general outmaneuvered them by his swift and unexpected flanking movements, against which the Boers' trenches and their rifle pits were useless. The relief of Kimberley was the object of his first effort, and it was carried out with admirable secrecy, boldness, and dash. Concentrating his army at Ramdam, to the north-east of Belmont, he sent the Highland brigade under General Macdonald to make an attack on the Boer right; but this was only a feint, and while Cronje was taking steps to crush it, General French—who had been recalled from Ladysmith, and had just succeeded in getting away with the last train which left the town before its final investment—with 5,000 mounted men and seven batteries of artillery, was dispatched to make a dash for Kimberley. General French set out on the night of February 11, and by

daybreak he had seized the Water-val drift (ford) and swept the enemy from the streams higher up the Riet River. Thirty more miles of hard riding, and he was at the Modder, where General Broadwood with the 12th Lancers rushed the Klip drift, and enabled him to strike at the Boer left. Here General Kelly-Kenny came up with two brigades of infantry and held the drift, while French pursued his victorious ride into Kimberley. Cronje, realizing the danger of his position, made a dash for liberty eastwards to Bloemfontein, while many of his force escaped to the north. Kelly-Kenny caught up the rear of the main body and kept up a running fight, till at last Cronje was headed off and brought to a halt at Paardeberg. He took refuge in the bed of the Modder River, where, on the morning of the 27th, finding his position wholly untenable, he capitulated with 4,000 men, and Majuba was avenged on its anniversary.

On the day that General French set out upon his famous ride Sir Redvers Buller renewed his activity on the Tugela, drove the Boers across the river, took Colenso from the eastern side, and after a heavy fight for Pieters Hill, turned the Boer positions. For nearly a fortnight he was occupied in incessant fighting, but on the 27th the last barrier was removed, and the day following Ladysmith was relieved.

Lord Roberts meanwhile set out for Bloemfontein, which surrendered to him on March 13. Presidents Kruger and Steyn making their escape to the north, after an unavailing appeal to the British government for peace on the basis of a recognition of the independence of the two republics. The Boers in the Colesberg district and the commandoes which had occupied Stormberg and Aliwal North retired in time to escape being cut off by Lord Roberts in rear, and thus the railway line was clear from Bloemfontein to the Cape. For six weeks Lord Roberts remained at the Free State capital, making his lines of communication secure, and bringing up by rail horses, mules, and stores. All these weeks De Wet gave the army no rest. In every possible way he threatened flank and rear to delay the advance on the Vaal River. He invested Wepener on the Caledon River, but was compelled to retreat on the appearance of a force under Generals Rundle and Brabant. Lord Roberts made the most elaborate dispositions to envelop him, but the wily Boer evaded every attempt. He laid an ambush at Sanna's Post, a few miles east of Bloemfontein, into which fell a force of several hundred men

retiring from Thaba-Nchu under Colonel Broadwood. By this coup the waterworks fell into the hands of the Boer general, and the consequences of that unlucky day were seen in the thousands of cases of enteric fever that struck down the army around Bloemfontein. Later, he surprised and forced to surrender five companies of infantry at Reddersburg, thus totalling in one week a capture of 1,200 men and seven guns.

On May 3 Lord Roberts's northern advance was resumed. With a front sometimes forty miles in length, the British army set out upon its march of 300 miles to the capital of the Transvaal, sweeping the country clear of the enemy as they went, and bearing down all opposition before them. Botha, who had succeeded to the post of Boer commander-in-chief on the death of Joubert on March 27, had reorganized his army, and made elaborate preparations for resistance; but time and again the Boers melted away from magnificent positions after long-range fighting. From Johannesburg they fled precipitately the moment the pressure of the British columns made itself felt, and on May 30 the town surrendered. A few days later, on June 5, Lord Roberts marched into Pretoria, and liberated 3,000 British prisoners.

Meanwhile General Buller had driven the enemy north, cleared Natal, and occupied Laing's Nek, and by means of the railway opened up a new channel of supply for the army of occupation, which by this time numbered close upon 250,000 men. Away in the west the little garrison at Mafeking had been holding out from the middle of October, their rations reduced to horse flesh and mouldy biscuits. Colonel Plumer had been steadily working south from Rhodesia, but his small force had been easily held in check by the Boers. On May 12 a supreme effort was made by the besiegers to rush the defences of the town. But Colonel Baden-Powell surrounded and cut off the attacking force when it got inside the camp, and captured a hundred prisoners, including Commandant Bloff, Kruger's grandson. The relief of the garrison was ultimately achieved by Colonel Mahon, who on May 4 set out from Barkley West with a mounted column, and made a dash for the town, which he succeeded in relieving on May 17.

It was confidently hoped that with the fall of Pretoria the war would end, but it dragged along for two whole years. Even while Roberts and his army were in and around the capital, De Wet had

made his way back again into the Free State, or the Orange River Colony, as it was now called, and had captured 500 Irish yeomanry at Lindley and a militia battalion at Roodeval. A determined effort was made to crush this renewed activity, resulting in the surrender of Prinsloo, one of the Boer leaders, with 4,000 men. De Wet and Olivier succeeded in escaping, but the latter and his two sons were soon afterwards captured at Winberg. De Wet next made preparations for a dash into the Transvaal, while Lord Kitchener, taking the command himself, thundered upon his heels. But on August 7 he crossed the Vaal with all his transport, leaving the British force in front of his deserted position, and moving across the Magaliesberg range made good his escape. Before the month was over he had recrossed the mountains and was marching south with a handful of men. This was the beginning of a long and tedious guerrilla warfare, which caused much useless bloodshed on both sides. In September De Wet fell upon Ladybrand, but was repulsed by a small garrison.

To relieve the pressure of the strong rearguard left by General Botha, Lord Roberts determined to drive the Boers to a more convenient distance—a determination which resulted in the battle of Diamond Hill and the retirement of the enemy. Quitting Pretoria about the end of August, Lord Roberts made his final advance, and, not without a severe struggle, in which the enemy lost some of the best and bravest of their men, joined hands with Buller at Belfast in Natal. Barberton and Lydenburg were taken; Koomati Poort was reached without further opposition; and a remnant of the burghers fled across the Portuguese border to Delagoa Bay, where President Kruger was already waiting for a Dutch man-of-war to convey him to Europe.

In December 1900 Lord Roberts returned to England, and the chief command devolved upon Lord Kitchener. De Wet continued as active as ever. His next move was to cross the Orange River and invade Cape Colony, but in this project he was frustrated through two other Boer leaders, Kritzinger and Hertzog, who succeeded in crossing the river and creating unrest for some weeks in the colony. After that De Wet projected an attack upon Cape Town itself, while Botha was to march upon Durban; but this bold scheme was likewise defeated, and again De Wet made his escape to the north, leaving many of his wagons in the hands of Colonel Plumer, who pursued him as far as Fauresmith. The vast

tracts of country over which they manoeuvred, and the mobility of the Boer forces, enabled the enemy to appear and disappear, to concentrate and disperse, with a suddenness that was almost magical; and as ordinary methods of warfare proved futile against them, Lord Kitchener set about the establishment of an extensive system of blockhouses along the railway line, each one garrisoned and in communication with its neighbour on either side. Armoured trains scouring the lines were able to bring help when called for. De Wet, seeing in this new plan the deathblow to his methods of warfare, fell upon a sleeping camp at Tweefontein with dramatic suddenness and disastrous results. But the chain which Lord Kitchener was forging was tightening around him. On the anniversary of Majuba he met with a serious reverse, losing half his command and his son, who was made prisoner. As the year 1901 advanced and the blockhouse system was extended, the forces of the enemy were more and more confined. In the Eastern Transvaal, where General Bruce Hamilton conducted the operations, the chief incidents were a night attack upon Trigaardsfontein, succeeded by another night march and the rout of the enemy; an engagement between Plumer's New Zealanders and the Boers at Twyfelaar; and a hand-to-hand fight between mounted men under Major Vallentin and the enemy, who was repulsed, Commandant Opperman being left dead upon the field. In the same district a column under Colonel Urmon was unsuccessfully attacked, Commandant Kreyer was killed, and the remnant of the Boer government escaped in a Cape cart only a few hours before their laager was occupied. After the capture of General Ben Viljoen, one of the most prominent of the burgher leaders, forced marches and night surprises were so increasingly and successfully employed that the Boers would not bivouac within forty miles of the British troops—a circumstance which made the task of getting within striking distance more and more difficult. In January 1902 General Beyers made an unsuccessful attack upon Pietersburg, and in the south-west Commandant Sarel Albert's laager suffered severely at the hands of the Scottish Horse. In the Orange River Colony a sweeping movement was organized by Lord Kitchener, which had for its object the final breaking of the power of De Wet. The 'great drive,' as it was called, began early in February, and so thoroughly was it carried out that the Boer general and his followers

were speedily shut into the trap. But De Wet, ordering his men to disperse and seek individual safety, with a handful as a body-guard rushed a herd of cattle at the wire fence on the Kroomstadt-Lindley blockhouse line, and so made an avenue of escape. But the movement put an end to De Wet's projected concentration for another raid into Cape Colony. The fortune of war, however, was not all on the side of the British even now. In an attack by Generals Kemp and Delarey on a convoy in the south-west near Klerksdorp, when about to cross a narrow spruit, the British found it impossible to extricate their rearguard, and the whole escort, with the exception of three officers and 100 men, fell into the hands of the enemy. Following their usual tactics, the Boer commandoes dispersed and left no trace for the troops which were immediately sent in pursuit. A few days later, however, on March 7, the commandoes suddenly concentrated again, and under the same generals fell upon a column under Lord Methuen, which had been sent out from Vryburg to intercept them and recapture the guns. Lord Methuen was shot in the thigh while gallantly attempting to rally his men, and was taken prisoner, but was speedily released and sent into the British lines. Lord Kitchener, however, continued through success and disaster steadily to wear down the Boer forces. Once again a great drive was planned and carried into execution, and though De Wet, this time accompanied by Steyn, succeeded in repeating his manoeuvre of rushing a great herd of cattle through the only available line of escape, the enemy was severely punished. This was the last important engagement of the war.

A peace movement was originated among the burghers about the end of March, and though the war still continued to be vigorously prosecuted, Lord Kitchener granted facilities to the various commandoes to elect and send delegates to a conference at Ver-eniging. This conference met on May 14 and accepted the terms of surrender submitted to them by the British government—terms which were duly signed at Pretoria on the 31st of the month. Thus ended a war which cost the British nation the lives of more than 20,000 men. See L. S. Amery's *'Times' History of the Boer War* (1902), Sir A. Conan Doyle's *The Great Boer War* (1902), and *The War in South Africa*, prepared by the German general staff (trans. by Colonel Du Cane, 1905). The British official history of the war is promised this year (1906).

South America is wider in the N. and tapers to the S., forming a somewhat pear-shaped outline. Its extreme southern point is Cape Horn (more properly Hoorn), in 56° S. The extreme length is 4,500 m. The continent is bounded on the W. by the Pacific, and on the E. by the Atlantic Ocean, where Africa approaches within 1,700 m. of Cape San Roque. Its area is 7,700,000 sq. m. The average elevation of the continent is 2,000 ft.; yet over 40 per cent. lies below 600 ft., a greater proportion than in any other continent except Europe.

Physical Divisions.—S. America is essentially an Atlantic and not a Pacific continent. Extensive highlands exist in the N., divided by the broad valley of the Amazons into the Guiana highlands in the N., and the Brazilian highlands in the S. Communication is also possible by the lowlands of the Orinoco valley in the N., and by those of the Plate basin in the S. There are thus three great gateways to the central lowlands, which are completely shut off from the Pacific by the W. Cordillera area. This is a band of one or more young folded mountain chains, with plateaus between, and varies in width from a few miles to 500.

The Eastern Highlands.—The Guiana highlands consist of Archean rocks, covered in the W., or Venezuelan part, by horizontal layers of sandstone, whose highest parts are Ioutu (probably 11,000 ft.) and Roraima (8,600 ft.). In the E. part the highest region lies in the S., and descends sharply to the Amazons basin; the longer rivers to the N. pass from terrace to terrace in great waterfalls. The coast is flat and sandy, formed by ocean currents. The Brazilian highlands are very largely made up of Mesozoic sandstone fringed with Palaeozoic strata; and Archean masses constitute the plateaus of Matto Grosso, Goyaz, and that between the São Francisco valley and the sea. The coast is mainly low, of Tertiary sediments, and between the Amazons and the Parahyba it is bordered by a sandstone reef, revealing a former extension of the continent. This is followed by a steep coast with numerous inlets, the picturesque bay of Rio de Janeiro being the largest. From the tropic to the Plate the coast is flat, and contains the large lagoons Patos and Mirim. The valley line of the São Francisco-Parana divides an eastern band from the rest of the highlands, which are drained to the Amazons in the N., and to the Parana-Paraguay in the S., the Goyaz (1,800 ft.) and Matto Grosso (1,600 ft.) plateaus forming the divide.

The central plains cover two-thirds of S. America. To the S. of the Plate estuary the pampa region may be distinguished. The Orinoco basin consists of a series of upper terraces, rocky and gravelly, dry and cut up by the rivers which here flow in gorges, and the flat lower plains, which are flooded during the rains, but are arid in the dry season. The rivers form rapids and falls where they sink from

those of the Paraguay basin. According to Oclonel Church, the plains of the Plate basin pampa were comparatively recently the site of a great sea, with which the Mojos Lake was connected, and has been separated by the gradual elevation of the present Amazons-Paraguay divide through the accumulation of waste carried down from the Andes by the Rio Grande and the Parapiti. The drying up of this pampean sea, two-thirds



South America—Contours.

one terrace to another. Much of the basin is yet to be explored in detail. The Amazons basin also consists of a succession of low terraces, with a fall-line along their margin. Quaternary deposits lie on either side of the main river, fringed by Tertiary rocks, as if a great gourd-shaped hollow had been gradually reclaimed from the sea. The upper part of the Madeira tributary flows through a filled-up lake—the Mojos—whose deposits are similar to, and continuous with,

the area of the Mediterranean, has affected the climate, increasing the aridity, and may explain the shrinkage of Lake Titicaca.

The Western Cordillera area, sometimes collectively known as the Andes, extends over one-sixth of the earth's circumference. In the N. it curves in a great arc from the Caribbean Sea to Arica (18° S.), and is narrowest in the centre, opposite the Gulf of Guayaquil, but it spreads out into several ranges, with intermontane plateaus towards each

end. At Arica the system is widest (500 m.), and includes the lofty plateau of Bolivia, drained to Lakes Titicaca and Aullagas. The system narrows to the s., and only one main range is prominent beyond Aconcagua (23,080 ft.), the highest summit. The S. Andes are heavily glaciated. Several outliers rise above the pampa—e.g. sierras of Cordoba, Tandil, and Ventana—and the Patagonian plateau. A lower

gulf is that of Guayaquil, except s. of 42° s., where there is a well-developed fiord coast.

The only islands of S. America of any importance are the small ones which lie parallel to the concordant coasts of Venezuela and Trinidad; the Falkland Islands, which rise above the continental platform in the extreme s.; and the volcanic Galapagos Islands on the equator, which have no physical connection with S.

perature of any continent, for the greatest difference between mean monthly temperatures is only about 30° F., and is recorded w. of the lower Paraná. In January the N.E. trade winds are drawn across the equator, and carry rain to the s. part of the Amazons basin. Near the equator a double rainy season occurs; beyond the equatorial zone only one, and that in summer, except in the extreme s.w., to which stormy westerly winds bring rain, especially in winter. In the pampa, the cold, dry s.w. wind alternates with oppressive moist, warm winds from the N. The former, known as the *pampero*, is commonest in spring; the latter, the *zonda*, in summer. The Andes are a complete climatic divide. In the s. they prevent storm-wind rains from reaching the lands E. of the mountains except off the coast. Farther N. the E. is very wet, while the W. coast is arid. The climate on the mountain plateaus and summits varies with the altitude. Nothing corresponding to the English winter is experienced at Quito. Severe cold and bleak storms are not uncommon on the plateaus of the Sierra de Merida in the north and on the Bolivian puna.

Hydrography.—The river system of S. America has often been compared with that of N. America. The Plate rivers correspond to the Missouri-Mississippi; the Amazons to the St. Lawrence; and the Orinoco to the Saskatchewan-Nelson, or, better, to the Mackenzie; and the Magdalena, draining the Cordilleran area to the N., to the Yukon. S. America has the advantage of being surrounded by seas never closed by ice, so that the routes to the interior can be reached at all seasons. Several rivers to the E. of and between the Cordillera do not reach the sea. The Bolivian plateau is the most important of these inland drainage areas. Few and short are the rivers to the Pacific. In the Patagonian Andes the west-flowing rivers are extending their valleys to the E., owing to the steeper gradients of their beds and the greater rainfall, and many have shifted their divides to the E. of the main chain. Most of the valley lakes, which are a well-marked feature of the hollow between the main range and the pre-Cordillera to the E., have their outlet to the Pacific. The mighty Amazons, 'an inland sea rather than a river,' is the largest and most important of S. American streams. As it flows in the equatorial regions of almost constant rains, receiving tributaries both from N. and from S., its volume is pretty constant, for the northern tributaries are in flood when the



South America—Rainfall.

coastal chain, separated by a longitudinal valley from the main chain, can be traced from Panama to 6° s., and from Arica to the extreme s. The mountains of N. Venezuela, Trinidad, and probably the Sierra de Santa Marta, seem to be distinct from the N. Andes, and may represent the end of the Antillean chain. Active volcanoes are numerous, especially s. of Lake Titicaca and in Ecuador. The W. coast is concordant, with few breaks. The most important transverse

America, although usually considered with that continent.

Climate.—Three-quarters of S. America lie between the tropics. Over the greater part of the inter-tropical region the mean annual temperature is over 80° F., and the range rarely more than 10° F. The W. coast is an exception, for owing to cold ocean currents the annual isotherm of 70° F. reaches N. to 10° s. In the extreme s. the mean annual temperature is 50° F., with a very small range. S. America has much the most equable tem-

southern ones are low, and *vice versa*. The Magdalena, Orinoco, São Francisco, and Plate rivers are fuller after summer rains. The united basins of the Colorado and Negro are larger than any others, except those of the Amazons and Plate rivers; but their flow is more irregular, as they lie farther s., in regions of less regular rainfall.

Minerals.—S. America is famous for its diamonds, found in Brazil, and for its gold and silver mines. Silver is abundant in the Andes, where gold, mercury, and copper are also found. Gold is common in the rocks of the eastern highlands, where iron, copper, manganese, lead, antimony, and other ores exist. S. America has little coal. Some is found in the southern states of Brazil and in Patagonia. The only mines on the w. coast are in Southern Chile. Nitrates abound in the western desert and in all the dry regions of the east.

Soils.—The rocks of the eastern highlands have weathered into laterite. The lowlands of the Orinoco and Amazons are covered with alluvium, those s. of the tropic of Capricorn with loess, and the Patagonian plateau with morainic deposits. The loess lies on the equatorial side of the glacial deposits, as in Europe. In the western valleys of the Andes s. of 30° s., where the rainfall is over 10 in. per annum, loam is the characteristic soil. Farther N., as far as the Gulf of Guayaquil, light and often moving sands cover the land. In the mountains, in addition to the characteristic exposed rock and talus of rock waste, are the finer volcanic soils of the volcanic regions, and an alluvial plain in Bolivia which represents the former extent of the shrunken Lake Titicaca.

Vegetation.—Most of the vegetation of S. America is tropical in character; but a temperate flora is found in the southern parts of the continent, and a high mountain (alpine) one in the high Andes. S. America may be divided into eight floral areas:—(1.) The wet jungles of the inter-tropical wet regions, more particularly in the basin of the Amazons, on the seaward slopes of the Guiana highlands, in the Northern Andes, and on the E. coast as far s. as 30° s. (2.) The savannas of the Orinoco, the Brazilian highlands, and the Plate basin. These are called *llanos* on the Orinoco, *caatangas* in the northern and *campos* in the southern Brazilian highlands. (3.) The poor steppes of Patagonia. (4.) The high mountain floral area of the Andes. (5.) The poor steppes, passing into deserts, of

the puna and parama. (6.) The desert region w. of the Andes, extending to 30° s. (7.) The sub-tropical evergreen forest region s. of 30° s., passing rapidly into (8), the deciduous temperate forests and the coniferous woods of the rainy region of the s.

The wet jungles of S. America are exceptionally rich in species. The trees attain an enormous size; lianas and climbers form a forest in themselves. Epiphytes, such as bromelias, cactuses, or-

ous. Thicker woods indicate the course of the streams. The caatanga woods of the N. Brazilian highlands are not very high, and lose their leaves in the dry winter. On the slightly poorer campos of the S. Brazilian highlands palms and mimosa are common. In the pinheiros, farther s., appear evergreen species, such as the maté and the ilex, which supply Paraguay tea. The Gran Chaco is a great park-land covered with mimosa scrub. The characteristic



South America—Temperature.

chids, and ferns, are very numerous. Unbranched perpendicular air-roots are very characteristic of the wet jungles. On the rivers the great Victoria Regia lily spreads its broad leaves. Tree-palms are more numerous than in other tropical forests. On the llanos, in the rainy season, the grasses reach a height of five or six feet. The plain is dotted with trees, single or in groups, among which fan-palms and pillar-shaped cactuses are conspicu-

ous. The pampa is a savanna, wooded only along the water-courses. Towards the w. it passes into salt steppes, and towards the s. into the poor steppes of Patagonia, the latter remarkable as being the only ones on the E. coast of any land.

In the Cordilleras in the N., where the rains are heavy, the valleys contain wet jungles, passing at about 5,000 ft. into the *tierra templada* (temperate zones), where the woods are still thick,

but lose their tropical character. Here oaks and tree-ferns are found, while cinchona and gentian flourish. The wax-palm grows up to nearly 12,000 ft. Bamboos make their appearance, giving place to grasses, moss, and lichens in succession. The damp eastern slopes farther s. have very similar vegetation; but the plateaus of Bolivia are covered with dry ichu grass, and with composites and gentians, some species being identical with those found in Europe. The paramas are treeless steppes, with a few dwarf shrubs; but the higher and drier punas farther s. are poor steppes, with scanty patches of ichu grass. The dry western slopes of the Andes of Peru, from the Gulf of Guayaquil to Arica, are poor steppes, with here and there a tamarind or mimosa tree, passing in the N. of Chile over into the Atacama Desert. On its southern confines the steppe becomes richer, and passes into the evergreen woods of Central Chile, shrubby in the N., but finely wooded in the more rainy s. Oleanders, myrtles, and willows are found along the streams. South of 40° s. extends an almost impenetrable, temperate forest. In S. Chile conifers are mixed with deciduous trees, such as the beech, replaced by peat mosses, with shrubs like the cranberry, and species allied to the N. European flora, at higher elevations or in higher latitudes. In the Chonos archipelago and on the adjacent mainland potatoes grow wild.

Animals.—S. America consists of two faunal provinces.—the Brazilian, comprising the tropical forests and savannas; and the Chilean, comprising the mountains and southern steppes. The Brazilian or forest region is far the richer, and presents many characteristic types. These include 'the prehensile-tailed monkeys and the marmosets, the blood-sucking bats, the coati-mondis, the peccaries, the llamas and alpacas, chinchillas, the agoutis, the sloths, the armadillos, and the ant-eaters.' Bird-life is richly represented. There are 'the charming sugar-birds, the immense and wonderfully varied group of tanagers, the exquisitely little manakins, and the gorgeously-coloured chatters; the host of tree-creepers, the wonderful toucans, the puff-birds, jacamars, todies, and motmots; the marvellous assemblage of four hundred distinct kinds of humming-birds, the gorgeous macaws, the curassows, the trumpeters, and the sun-bitterns. Here, again, there is no other continent or region that can produce such an assemblage of remarkable and perfectly distinct groups of birds' (Wallace's *Is-*

land Life, 1880). Many of these forms, notably the marmosets, monkeys, sloths, tapirs, and peccaries, are absent in the Chilean region. 'Among the characteristic types are prominent the vicuñas of the Andes, the guanacos of the Argentine pampa and Patagonia, the spectacled bears of the Andes, and the chinchillas of the same elevated region' (Lydekker's *Geographical History of Mammals*). Llamas and alpacas have been domesticated, both for their wool and for their utility as pack animals at high altitudes. Armadillos are very numerous. Great vultures are also numerous. The jaguar, locally called a 'tiger,' and the puma ('lion') are the chief representatives of the great cats.

People.—S. America was invaded by Europeans earlier than N. America. The invaders were Spaniards, except in Brazil, where they were Portuguese. They united freely with the natives, producing a population of mixed blood. As in N. America, African slaves were imported to cultivate the land, especially into Brazil and Guiana, leading to further intermixture. Black, white, and yellow blood are therefore mingled in many S. American peoples; and Reclus considers these mixed races as forming types of average humanity. On the arrival of the Spaniards, advanced civilization existed on the plateaus and western slopes of the Andes, from the equator to 30° s. The predominant race at that time was the Quechuan or Quichuan. A priestly military organization under the Incas was probably declining, and was easily overcome by the Spaniards. The puna contains magnificent ruins of ancient buildings, showing great skill in their builders, who were probably the Aymara tribes, subsequently conquered by the Quichuas. South of 30° s. are the forest tribes known as the Araucanians, who still preserve their independence. In the forested islands of the s.w., and in Tierra del Fuego, live the Fuegians. The Patagonians are taller than any other S. Americans, except the Borovos, who live to the s. of Goyaz. The Guachos of the pampa owe their origin to the intermixture of pampa Indians and Spaniards. The forests and savannas are inhabited by four chief races, still more or less pure. These are the Tupi-Guaranians, on the Brazilian highlands and in the Amazonas basin, whose language is the lingua franca of Brazil and Paraguay; the Gesan or Tapuyan family, in E. Brazil, nomadic hunters, who are probably the true aborigines; and the Arawaks and Caribs, similar physico-

ally, but speaking distinct languages. The Arawaks are found in the Eastern Guianas and as far s. as Paraguay. The Caribs probably originated in the Matto Grosso and Goyaz plateaus, and spread N. across the llanos. A few are still found in the Caribbean islands.

Economic Survey.—South of 40° hunting and fishing are the chief occupations, except in the favoured valleys of Chile, where agriculture has developed. The lower part of the Paraná-Paraguay basin, and parts of Paraguay and Southern Brazil, are also agricultural, as well as the irrigated regions in the extreme w. of Argentina, and the highlands in which the São Francisco and Paraná rise. Round the Brazilian coasts, along the Paraná and Paraguay rivers, and here and there in the Guianas, Venezuela, and Ecuador, plantations have been formed. The caatangas and campos of Brazil are partly devoted to the rearing of animals and partly to plantations. The llanos of the Orinoco and the grassy lands s. of the Guiana highlands also rear stock, but the great breeding regions are the pampa and the plateaus of the Andes. The forests of S. America are scarcely exploited. The natives of the warmer regions plant a little manioc, but live mainly by the chase, and by bartering india-rubber and other forest produce with traders. Near the great navigable rivers, and wherever trade and European influence penetrate, there is considerable intermixture of blood and a gradual adoption of European civilization.

Political Divisions.—Portugal originally appropriated Brazil, and Spain the rest of S. America. The Central Guianas are divided between France, the Netherlands, and Britain. The other states have become the republics of Venezuela, Colombia, Ecuador, Peru, Chile, Argentina, Uruguay, Paraguay, and Brazil. These are not yet politically consolidated, and are subject to periodic revolutions.

See Martin's *Through Five Republics: Critical Description of Argentina, Brazil, Chile, Uruguay, and Venezuela* (1905), Akers's *History of South America, 1854-1904* (1904), Alcock's *Trade and Travel in South America* (1903), Fountain's *Great Mountains and Forests of South America* (1902), and Keane's *Central and South America*, vol. i. (1901).

Southampton, munic., parl., and co. bor. and seapt., Hants, England, on a peninsula between the Itchen and Test, at head of Southampton Water. St. Mary's (rebuilt 1884) represents the mother church, but the oldest

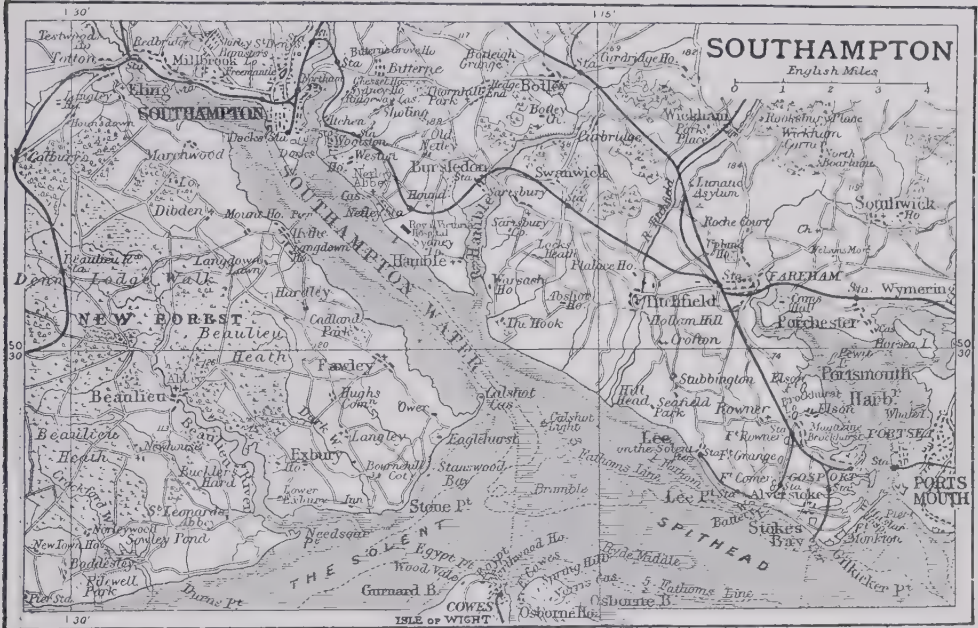
existing churches are St. Michael's (in part Norman), Holy Rood (ancient tower and spire), and the chapel of God's House (12th century), now used for French Protestant service. Considerable remains exist of the old town walls, erected by Richard II., with portions of towers and three gateways. One, Bargate, a massive structure in two stages, has a large chamber used as the Guildhall, and contains ancient paintings of the local legendary hero, Sir Bevis of Hampton, and of the giant Aescupart. There are several ancient domestic buildings, including King John's palace (12th century). Public buildings include the municipal offices, cus-

the newest (1905) 875 ft. long. A channel, with a minimum depth of 30 ft., connects with the sea. Southampton is the chief British military transport port, and is the regular port of call for several important mail steamship lines. The total imports (1904) were valued at £15,586,750 (butter, ornamental feathers, bacon, and beef about one-third); exports at £10,357,724 (cotton manufactures, apparel, and leather about one-third). Southampton has yacht-building and marine engineering works. Dr. Watts and Sir J. E. Millais were natives. The Romans had a station, Clausentum, on the site now occupied by Bitterne, E. of

Southampton, THOMAS WRIOTHESLEY, FOURTH EARL OF. See WRIOTHESLEY.

Southampton Water, inlet of sea, Hants, England, stretching N.W. from the Solent for 10 m.; width, 1½ to 2 m.; accessible for the largest vessels at all states of the tide. On a spit W. of the entrance is Calshot Castle, now a coastguard station; and on the E. side are the Royal Victoria (military) Hospital, and the ruins of Netley Abbey.

South Australia, one of the states of the Australian Commonwealth, was originally bounded on W. by 132°, and on E. by 141° E. long. A strip of unclaimed country W. of 132° E.,



tom house, post office, public library, and art gallery, Watts Memorial Hall, Hartley University College, free grammar school, Ordnance Survey offices, Royal Southampton Yacht Club. The Royal Victoria Pier forms a favourite promenade. In the centre of the town are parks and recreation grounds—East, West, and Queen's, the last containing a memorial to General Gordon (1885). North of the town, and connected with it by a magnificent avenue (1 m.), is Southampton Common (over 350 ac.). The Southampton Docks (property of L. & S.W.R.) are very extensive (233 ac.), including Outer, Inner, and Empress (18½ ac.) Docks, with extensions, coal barge docks, and six dry docks,

the Itchen; this was succeeded by the Saxon Hantune. Canute sometimes resided here, and after the Norman Conquest it became the port for Winchester. Henry V. embarked here on the French expedition (1415), and before his departure the conspiracy was discovered for which the Earl of Cambridge, Lord Scrope, and Sir Thomas Grey were executed. During the middle ages the port had great trade with Venice; its modern prosperity dates from the opening of the new docks (1842). It returns two members to the House of Commons. Pop. (1901) munic. bor., 104,824; parl. bor., 120,215.

Southampton, HENRY WRIOTHESLEY, THIRD EARL OF. See WRIOTHESLEY.

containing 80,000 sq. m., was added in 1861; and in 1863 all the region N. of 26° S. lat. up to the Indian Ocean, and between 129° and 138° E. long., was taken over, increasing the area to 903,700 sq. m. This Northern Territory, although politically a portion of S. Australia, is really a distinct country in climate, soil, and general conditions.

The chief features of S. Australia proper are the two mountain chains which follow generally the direction of the two gulfs, St. Vincent and Spencer's. The Adelaide chain, on the E., runs for 350 m., and reaches from 2,000 to 3,000 ft. (Mt. Cone, 2,601 ft.; Razorback, 2,834 ft.). Evidence of glacial action exists in places. On the E. slopes are

fertile plains, extending to the Lower Murray. The Flinders Range, on the w., runs from near St. Vincent Gulf to Lake Torrens. The highest peaks are Mt. Remarkable and Mt. Brown, each about 3,000 ft. North and west from Lake Torrens stretch vast plains. The s. coast is pierced by Spencer's and St. Vincent gulfs, and Encounter,

The largest portion of S. Australia is covered by Tertiary and Post-Tertiary deposits. In many parts of the state the remains of gigantic marsupials, such as Diprotodon and Macropus Titan, have been found, and fossil bones of Cetacea have been discovered near the Murray R.

The first mine was discovered in 1838, in Mt. Lofty ranges,

fram, gypsum, mica, nickel, platinum, gold, and other minerals, and diamonds and other gems, have been discovered, and coal is extensively worked at Leighs Creek.

The climate, although occasionally trying in midsummer, is one of the healthiest in the world. The coldest months are June, July, and August; the hottest,



South Australia.

Lacépède, and Rivoli bays. The coast-line is generally bold and rugged, with stretches of sand-dunes and low shores; but reefs make navigation dangerous and difficult. Inland there are chains of salt lakes, extensive marshes and salt swamps, large caves, and several large lakes—e.g. Eyre, Torrens, Gairdner.

near Adelaide, the mineral being silver-lead. Copper was first worked in 1843, at Kapunda; the Burra-Burra mine was opened in 1845. The Wallaroo and Moonta mines were discovered in 1861. The iron deposits are of great richness and extent, but have not yet been worked seriously. Bismuth, antimony, asbestos, wol-

December, January, and February. The thermometer in summer often registers over 105° in the shade, but the nights are always cool. The average rainfall at Mt. Lofty in the south is 49 in. At Parallana in the far north it is about 10 in. The average rainfall in the agricultural districts is 21.476 in.

The leading products are wheat, barley, oats, potatoes, and hay. An enormous area is peculiarly adapted for wine-growing, nearly one million gallons of wine being manufactured annually, of which about one-half is exported. Almonds, oranges, olives, raisins, and honey are also exported. The edible fish include the schnapper, mullet, salmon, and Murray cod.

In 1901 the population was 362,604, of whom 4,014 were in Northern Territory. In addition there were 3,888 natives. The chief seaport is Port Adelaide, on St. Vincent Gulf; others are Port Pirie, Wallaroo, and Port Augusta, on Spencer's Gulf. The total overseas imports for 1904 were £3,289,655, and exports £4,047,165; the interstate commerce being imports £4,161,061, and exports £4,435,036.

The government is carried on by an executive responsible to a Parliament of two chambers—a legislative assembly and a council—both of which are elective on the basis of manhood suffrage, and female suffrage has been in force since 1895. The premier is always a member of the assembly. The governor is appointed by the British government. All members of Parliament are salaried. There is no state church, but the population includes adherents of the Church of England, Roman Catholics, Wesleyan and other Methodists, Presbyterians, Lutherans, Congregationalists, Bible Christians, and Baptists. Education is free, secular, and compulsory. There is a university at Adelaide, with 622 students in 1905. For the defence of the colony there are about 5,000 militia and volunteers.

Although discovered by the Dutch in 1627, and Flinders charted its coast in 1802, S. Australia was not settled until Dec. 28, 1836. In 1856 responsible government came into force. A settlement was formed at Port Darwin, in Northern Territory, in 1869.

South Australian Railways are owned by the government, and centre in Adelaide. The longest line is from Port Augusta to Oodnadatta, 477 m. The total mileage worked (1904) was 1,895. The gauge is 3 ft. 6 in. and 5 ft. 3 in. The receipts for the year 1904 amounted to £1,238,907, and the expenditure to £705,747. The total expenditure on construction at June 1902 was £13,275,037.

South Bend, city, Indiana, U.S.A., co. seat of St. Joseph co., on St. Joseph R., 75 m. E.S.E. of Chicago. It manufactures carriages and wagons and agricultural implements. Pop. (1900) 35,999.

South Bethlehem. See BETHLEHEM (2).

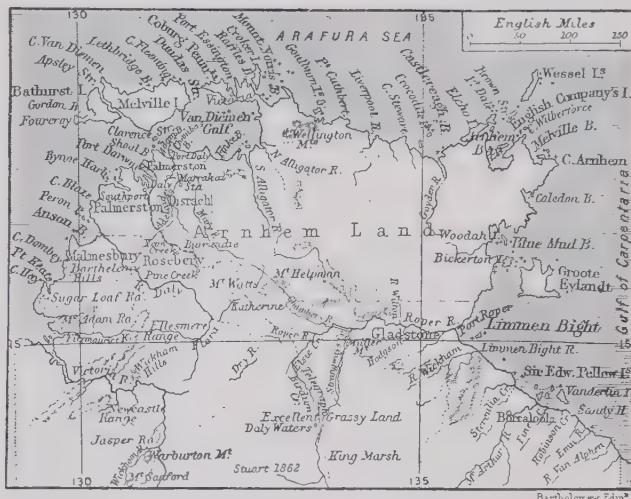
Southbridge, tn., Worcester co., Massachusetts, U.S.A., 20 m. S.W. of Worcester; manufactures cotton and woollen goods and spectacles. Pop. (1900) 10,025.

South Carolina. See CAROLINA.

Southcott, JOANNA (1750-1814), English religious visionary and sectary, was born at Gittisham in Devonshire. Having prophesied, and some of her predictions being verified by events, she and her adherents began (1792) to make a noise in the world. She proclaimed herself the 'woman' of Rev. 12, and began to seal the elect, 144,000, for a monetary consideration. But after 1808 the practice was dropped, for one of the sealed was hanged for murder at York. She had

east (2) the Julie Alps, which culminate in the Terglou or Triglav (9,395 ft.) and the Montasio (9,039 ft.), their best-known pass being the Predil (3,813 ft.), traversed by a carriage road from Tarvis to Görz. To the north-east of the Julie Alps, and separated from them by the Save valley, (3) the Karawanken Alps rise between that valley and the Drave. The eastern section of these culminates in the Grintove (8,429 ft.), the highest point of the western section being the Stou or Hochstuhl (7,346 ft.). See E. Richter's *Die Erschliessung der Ostalpen*, vol. iii. (1894); and Purtscheller and Hess's *Der Hochtourist in den Ostalpen*, vol. iii. (new ed. 1899).

Southend-on-Sea, munic. bor. and wat.-pl., Essex, England,



South Australia—Northern Territory.

come to London on the invitation of Sharp the engraver.

South Dakota. See DAKOTA—South.

South-Eastern Alps, the most easterly division of the Alps, includes the mountains rising south of the Drave valley (separating them from the central Tyrolean Alps) and east of the Piave valley (separating them from the Dolomites). Herein three distinct groups are usually distinguished. East of the Dolomites rise—(1) the Carnic Alps, which culminate in Kellerwand (9,227 ft.), though their best-known summit is Paralba (8,836 ft.); while the principal pass (Roman inscriptions on it) is the Monte Croce or Plöcken Pass (4,462 ft.), traversed by a bridle-path from Tolmezzo to Kotschach. Separated from the Carnic Alps by the Pontebba line of the railway, over the Saifnitz Pass (2,615 ft.), from Tarvis to Udine, rise to the

at mouth of Thames, 40 m. E. of London. There are two fine esplanades and a pier (1½ m. long). Among public buildings are the Kursaal, free library, and technical schools. Recreation grounds include a marine park and Chalkwell Hall Park (opened 1903). Westcliff is a new residential suburb. Prittlewell, about half a mile N., is the mother parish. A Cluniac priory was founded here in the time of Henry II. The town is mainly of 19th-century growth, and is much frequented by Londoners. Pop. (1901) 28,793.

Southerly Buster, in Australia, the strong, cool, cloudy rain-bringing south and south-west winds. It is usually experienced in the late spring, all summer, and during a portion of the autumn, and lasts from two hours to ten days. But the term 'buster,' in its restricted

sense, applies only to the squall or sudden change in the atmospheric conditions. The wind is most strongly felt on the eastern coast of Australia. The fall of temperature is rapid, in many cases as much as from 30° to 35°. This great fall, however, is seldom recorded except during the hotter months, when the temperature antecedent to the buster may reach 95° or more. See H. A. Hunt, in Abercromby's *Australian Weather* (1896).

Southern Alps, a chain of snow-clad mountains with an average height of 8,000 ft. and a snow-line of 7,500 ft., forming the backbone of the South Island of New Zealand, running parallel with and close to the west coast for about 100 m., and thrusting many long spurs eastward. Their culminating point is Mt. Cook (12,349 ft.), and several others exceed 10,000 ft. This region was first explored by Sir Julius von Haast in 1862. The range is crossed by three low passes—Harper's Pass; Arthur's Pass (3,000 ft.), over which runs the road from Christchurch to Hokitika, and over which the Midland Ry. is constructed; and Haast Pass (1,716 ft.). See W. S. Green's *The High Alps of New Zealand* (1883). Edward A. Fitzgerald's *Climbs in the New Zealand Alps* (1896), A. P. Harper's *Pioneer Work in the Alps of New Zealand* (1896), G. E. Mannering's *With Axe and Rope in the New Zealand Alps* (1891), and *New Zealand Alpine Journal* (1892-6).

Southern Cross. See CRUX.
Southerne, THOMAS (1660-1746), English dramatist, was born at Oxmantown, near Dublin. In 1682 was produced his play *The Loyal Brother, or the Persian Prince*. His best plays were tragedies, brought out after the revolution—*The Fatal Marriage* (1694) and *Oroonoko* (1696). His comedies were of the usual type.

Southern (or Cold) Lakes of New Zealand, twelve large and numerous smaller lakes of glacial origin in the south-west of South Island. Tekapo (15 m. by 3 m.), Pukaki (10 m. by 4 m.), and Ohau (12 m. by 2½ m.) are in Canterbury, and drained by the Waitaki. The others are all in Otago. Hawea (19 m. by 3 m.), Wanaka (35 m. by 1-3 m.), and Wakatipu (50 m. by 1-3½ m.) are drained by the Clutha; Te Anau (40 m. by 1-6 m.), Manapouri (50 sq. m.), and Monowai by the Waiau. The southernmost group consists of Pouteriteri, Hakapoua, and Hauaroa.

Southern Nigeria. By an Order in Council, dated Feb. 16, 1906, the administration of the Southern Nigeria Protectorate (see NIGERIA) was placed under that of the colony of Lagos, and

the name of that colony was changed to the colony of Southern Nigeria. It has a revenue exceeding £1,000,000, a trade of over £5,000,000, and a population of about 6,000,000.

Southern of France Railway, established in 1852, runs from Bordeaux to Bayonne and Irun on the Spanish frontier, and, *via* Montauban and Toulouse, to Narbonne and Montpellier, and from Narbonne to Port Vendres, the borders of Spain, and through all the districts south of the line from Bordeaux to Narbonne, with short branches running north to Albi, Rodez, and Neussargues—making a total length of 2,152 m. The company receives a subsidy and guarantee from the government, which retains power to purchase the line.

Southernwood, OLD MAN, LAD'S LOVE, or MAIDEN'S RUIN (*Artemisia abrotanum*), is an old garden plant, now mainly grown for the fragrance of its leaves, but formerly much valued for its real or supposed medicinal qualities. It is easily grown, preferring a light, rather poor soil, and may be readily propagated by means of seeds or cuttings.

Southey, ROBERT (1774-1843), English man of letters, born at Bristol. He entered Oxford a sympathizer with the French revolution; and wrote *Joan of Arc* (1793), an epic. In June 1794 he met Coleridge, and the two, whose lives were thenceforth linked, dreamed of emigrating to America and founding a communistic settlement. To raise money for this purpose they both lectured in Bristol. Cottle, a publisher of the town, who had already published for Southey and his friend Edmund Seward a small volume of verse, offered to bring out his *Joan of Arc*. But circumstances dashed the dream of 'pantisocracy.' In 1797 Southey secretly married Edith Fricker; but shortly afterwards an uncle (the Rev. Herbert Hill, chaplain to the British factory at Lisbon) constrained him to go out to Portugal (1795). On his return, in the following year, *Joan* was published, and he soon settled down near Norwich to verse-making, compiling, translating, and reviewing. Ballads (such as *William*) flowed freely from his pen; he made steady progress with another epic, *Madoc*; outlined a third, *The Destruction of Dom Daniel* (published as *Thalaba*). After another visit to Portugal (1800-1), where he finished *Thalaba* (1801), Southey entered upon a literary life, finding his home with his wife in 1803 at Greta Hall, Keswick. On the proceeds of articles in the *Quarterly Review*, book-making, an annuity from Wynn, replaced

after 1807 by a government pension, augmented in 1813 by the salary of poet laureate, and in 1835 by a pension of £300, which Peel got for him when he declined a baronetcy. Southey supported for a generation not only his own family, but Coleridge's wife and children. *Roderick* (1826) completed the tale of his epics, monuments of respectable craftsmanship, from which the dust is rarely blown. His first wife died in 1837, and two years afterwards he married Caroline Bowles. But his mind was already giving way, and he died on March 21, 1843. His *History of Brazil* (1810-19) is not read, and his *History of the Peninsular War* (1823-32) was superseded by Napier's. His best biographies are the *Life of Nelson* (1813) and the *Life of Wesley* (1820). He wrote also a *Life of Cowper*



Robert Southey.

(1833-37), translations of *Amadis* (1803), and *The Cid* (1808), *Esopriella's Letters* (1807), pseudo-Spanish sketches of England, and *The Doctor* (1834-7), a medley of aphorisms, anecdote, and humour. Southey is recognized as a classic prose writer. He was a capable biographer, a second-rate essayist, and a poet who rarely rose to distinction. His *Poetical Works* appeared (1837-8), *Lives of the Admirals* (1833-40), and *Letters* (1849-50). See Dowden's *Southey* in English Men of Letters (1879).

South Foreland, on the coast of Kent, the nearest point of England to the coast of France. Off it an important naval battle was fought on Aug. 24, 1217. Eustace the monk, in the service of Louis of France, left Calais in order to attempt a landing in the mouth of the Thames. Hubert de Burgh, justiciary and governor of Dover Castle, intercepted him,

and the French were completely defeated, only fifteen ships out of fifty escaping.

South Holland. See HOLLAND, SOUTH.

South Indian Railway was formed primarily as the Indian Tramway Company, and was taken over by the Carnatic Railway Company, with which was amalgamated in 1874 the Great Southern of India Ry. The present railway, which includes a number of similar lines since added, is worked and maintained for the Secretary of State for India. It covers S. India from Madras to Tuticorin, with branches to Pamban and Quilon—the total mileage being 1,034, with about 200 m. of branches. The share capital is £1,000,000, and interest at the rate of 3 per cent. is guaranteed by the Secretary of State, in addition to excess dividends on profits, which amounted for the four years 1897–1900 to 2 per cent., and for 1904 to 3½ per cent.

South Island. See NEW ZEALAND.

South Italian Railway, constituted in 1862, serves the N. of Italy from the Swiss frontier at Chiasso, through Milan, Pavia, Verona, Cremona, Mantua, and Padua, to Venice, touching the Austrian frontier at Pontebba and Cormons. It also serves the Adriatic coast, through Parma, Modena, Bologna, Ancona, and Foggia, to Brindisi and Otranto, and has connecting lines to Florence, Rome, and Naples. Total length, about 3,600 m.

South Molton, munic. bor., Devonshire, England, 12 m. E. by S. of Barnstaple. The church of St. Mary Magdalene (Perpendicular) has a handsome tower. Industries include leather-dressing, coachbuilding, and the manufacture of agricultural implements. Pop. (1901) 2,848.

South Omaha. See OMAHA.

Southport, munic. bor. and wat.-pl., Lancashire, England, 18 m. N. of Liverpool, extends 2 m. along the coast, and has a handsome esplanade and marine drive. Marine park and lake (44 ac.) front the shore. Hesketh Park is prettily laid out at the northern end of the town; there are botanic gardens, winter garden, and zoological park. The public buildings include town hall, Cambridge Hall, Atkinson Art Gallery and Free Library, and market hall, and there are several hydropathic establishments. Birkdale is a southern residential suburb. Pop. (1901) 48,083.

Southsea, tn., Hants, England, forming part of Portsmouth, immediately S. of Landport. It is a residential suburb and watering-place, and has an esplanade adorned with many naval memorials.

South Sea Scheme, or as it is often named the 'SOUTH SEA BUBBLE,' arose out of Lord Treasurer Harley's desire to get taken up the large floating debt which the war of the Spanish Succession (1701–13) had created. The Company of Merchants of Great Britain was granted exclusive rights of trading on the east and west coasts of S. America, and all lands it might discover within three hundred leagues from the shore were to be held by the company under the crown. The peace of Utrecht (1713) transferred to England the Assiento privilege of carrying negroes to Spanish America, and this privilege was handed over to the company. In 1714, by the further transformation of government debt, the capital stock was increased to £10,000,000; and in 1719 the directors of the company proposed to absorb the whole national debt and pay 5 per cent. interest for seven years and 4 per cent. thereafter. They offered for this privilege £7,567,000. The company seems to have done little legitimate trading. The public, however, misled by the countenance and support which the government gave to the company, formed extravagant ideas of the possible value of the South Sea trade, and speculation carried the stock to £1,000 for every £100 subscribed. Then all sorts of companies were floated, and men invested blindly in the most ridiculous projects, such as proposals to import asses from Spain and to extract silver from seawater. The whole of England seemed to have gone mad, save only Walpole. He had always opposed this South Sea scheme, and to him the nation turned to restore the public credit and to find the best way out of the mess. Walpole dealt leniently with the directors, and remitted the obligations of the company to the public, thus favouring the ordinary stockholder. The South Sea Company was not dissolved, but it carried on a legitimate business thereafter. It engaged in the whale fishery with no great success, and trafficked in negro slaves. Although after 1750 it ceased to be a trading company, it was not till 1807 that it was deprived of its exclusive trading privileges in the South Seas. See Mackay's *Memoirs of Extraordinary Popular Delusions* (1852), and Cox's *Memoirs of Sir Robert Walpole* (1802.)

South Shetlands, group of mountainous islands in the Antarctic Ocean, about 600 m. S. of Cape Horn. They are twelve in number—Clarence, George I., Livingstone, Deception, and Smith being the chief—and cover an area of 880 sq. m.

South Shields. See SHIELDS.

Southwark, met. bor., Surrey, England, on Thames, called by Londoners 'the Borough.' St. Saviour's Church, now the cathedral of the diocese of Southwark (constituted 1905), belonged to the 11th-century priory of St. Mary Overy. It was rebuilt 13th century. Its monuments include one to the poet Gower, buried here. Among other noteworthy buildings are Spurgeon's Tabernacle, St. George's Church, Roman Catholic cathedral, Guy's Hospital, Hop Exchange, Bethlehem Hospital, and the Surrey and Kensington Theatres. The site of Shakespeare's Globe Theatre is now occupied by a brewery. Pop. (1901) 206,180.

Southwell, tn., Notts, England, 14 m. N.E. of Nottingham. The minster church of St. Mary (seat of diocese formed 1884, comprising the counties of Derby and Notts), was founded about 630. It is a cruciform edifice with central and two western towers, and presents fine examples of early architecture (transepts early 12th, choir 13th, stone screen 14th century). It contains the tombs of several archbishops of York. Remains exist of the archiepiscopal palace, a favourite residence of Cardinal Wolsey. Pop. (1901) 3,161.

Southwell, ROBERT (c. 1561–95), poet and Jesuit spy, was born probably at Horsham, Norfolk, and admitted a Jesuit in 1578. In 1586 he came to England with Father Henry Garnet, and passed as a Protestant under the name of Cotton. In 1592 he was caught, and was led to prison and to torture, and in 1595 he was hung for treason. He left a good deal of prose and verse, of which the lines *The Burning Babe* are best known. His *Collected Poems* were edited by A. B. Grosart (1872), and *Collected Prose* by W. J. Walter (1828).

Southwold, seaside resort and munic. bor., Suffolk, England, 41 m. by rail N.E. of Ipswich; has a fine 15th-century church. Pop. (1901) 2,800. See also SOLE BAY.

Souvestre, Emile (1806–54), French *littérateur*, born at Morlaix, settled at Paris (1836), where his Breton novels won him fame. Amongst these are *Les Derniers Bretons* (1835–7), *Pierre et Jean* (1842), *Foyer Breton* (1844), *Scènes de la Chouannerie* (1852), and *Chroniques de la Mer* (1853). His best book is, however, *Un Philosophe sous les Toits* (1850); he also wrote many plays and farces, and published *Causeries Historiques et Littéraires* (2 vols. (1854).

Souza-Botelho, Adèle Marie Émile Filleul, Marquise de (1761–1836), French novelist,

born at Paris, married (1784) Count de Flahaut, and after he was guillotined (1793) took refuge in England. There she wrote *Adèle de Sénanges* (1794), a domestic novel. She charmed Napoleon by her wit, knew and inspired Louis Philippe, and at Talleyrand's met her second husband (1802), the Portuguese minister at Paris, Marquis de Souza-Botelho. In 1808 appeared *Eugène de Rothelin*, usually esteemed her best book, a picture of 18th-century aristocratic society, distinguished by refinement of style. Some of her other books are *Charles et Marie* (1802), English scenes; *Comtesse de Fargy* (1823), convent life; *Eugénie et Mathilde* (1811), exile; *Emilie et Alphonse* (1799); and *Mademoiselle de Tournon* (1820). Her *Œuvres Complètes* appeared in 6 vols. (1811-22), and *Œuvres Choiesies*, with notice (1840-5).

Sovereign. (1.) One who exercises supreme control or dominion, but generally applied only to the hereditary rulers of states—e.g. king, emperor, Czar. (2.) A British gold coin worth one pound sterling, or twenty shillings, first issued by Henry VII., and which continued to be issued till the time of James I. It was revived by George III., and is still issued.

Sovereignty. During the middle ages the word 'sovereign' and its compounds were simply equivalent to 'head' or 'chief.' It was, of course, most frequently applied to the king as the head of the state; but it was also used to describe the bishop of a diocese, the abbot of a monastery, and even the provost or master of a college. With the political speculators of the 16th and 17th centuries, however, especially with Bodin, Grotius, Hobbes, and Filmer, the term was used to signify that absolute freedom from external control, combined with that absolute power over its own members, which the revolt against the mediæval doctrine of the Holy Roman empire led the modern school of thinkers to attribute to every independent state. Thus sovereignty became an abstraction, used to signify that totality of independence and power which may be vested in a king, or in a king and parliament, or in an assembly alone. The great champion and popularizer of this view in England was the jurist John Austin (*A Plea for the Constitution*, 1859). Not only did he labour to prove that every act of political power in the United Kingdom (he does not seem to have considered the case of the colonies) was the act, direct or indirect, of the crown, lords, and commons, or, as he

subsequently modified it, of the crown, lords, and electors; but he asserted, in spite of manifest evidence to the contrary, that a person or body of persons invested with similar powers must necessarily exist in every organized political community. The first serious check which this view met with was from the advocates of the new historical method of legal and political study, prominent amongst whom was Sir Henry Maine, whose brilliant book on *Ancient Law* was published in 1861. Somewhat staggered by his attack, the Austinian school of jurists fell back on the compromise that, whatever may have been the case in rudimentary stages of development, the Austinian doctrine was true of all civilized communities. Even this claim has, however, been powerfully resisted by recent writers, conspicuously by Professor Dicey, who points out that many of the most advanced modern political communities have in practice rejected the doctrine of sovereignty as Austin preached it. The truth of the matter appears to be this, that there have from time to time existed certain political communities in which the acts of a given person or body of persons could not be legally questioned by any regularly constituted authority, internal or external. Two conspicuous examples are the empire of the Russias, in which the ukase of the Czar cannot be questioned before any tribunal; and the British empire, in which a formally enacted statute of the crown in Parliament enjoys a similar immunity. Of course there is always the 'sacred right of revolt'; but this is not a legal restriction. Of these and similar communities Austin's doctrine is only approximately true. One of the most conspicuous features of the many 'written constitutions' which sprang into life during the 19th century is the careful restriction placed by them on the powers not merely of the monarch or head of the state, but on the parliament or other legislative body. These restrictions are legal; they can be pleaded before regularly constituted tribunals. Their existence is a complete answer to the theory of sovereignty as understood by Austin. This is the case even in so-called 'unitary' constitutions, such as those of France and Belgium. It is still more true of federal constitutions, such as those of Germany and the United States of America, by which political power is elaborately partitioned out amongst various co-ordinate and independent authorities. The writers of the Austinian school have en-

deavoured to rebut this obvious truth by arguing that the body with whom lies the power of amending the constitution is in such case the real sovereign body. This argument is a shade stronger than that of Blackstone, who asserts that sovereign power necessarily belongs to that body in the state which has power to enact laws, apparently quite regardless of *what* laws it has power to enact. But even the Austinian argument reveals the weakness of the doctrine which it is quoted to support. Austin's 'sovereign' is an active, constantly watchful, and vigilant power, from which proceeds every political act—legislative, executive, judicial. The constitution-amending power of the written constitution is usually a very elaborately formed body, apparently devised in such a manner as to present the most extreme possible difficulty in calling it into action. Such a power may be a sovereign *in posse*; and to such a sovereign it has been proposed to apply the epithet of 'political,' whilst the sovereign power as ordinarily understood is to be known as 'legal.' But to make such a distinction is to destroy the whole point of Austin's theory. As a matter of fact, the framers of the written constitutions have usually aimed at preventing the exercise of unlimited power by any person or body of persons.

Sovereignty of the Sea. It is now universally agreed that the open sea is common and free to all peoples, and that only a comparatively small margin around the coasts can truly belong to any state in particular. For many centuries, however, the contrary doctrine prevailed. Wide extents of sea, and even oceans, were claimed by one power or another as exclusively pertaining to it, and navigation or fishing within such areas was prohibited to foreigners, or only allowed under specified conditions. Thus Venice claimed sovereignty over the whole of the Adriatic. It first exacted a toll from vessels passing through that sea, and then, in the 13th century, declared its full rights of sovereignty. Genoa, Pisa, and Bologna endeavoured to resist this pretension by armed force; but after several wars, in which they were worsted, they were obliged to submit. As an assertion of the maritime supremacy of his state, the doge of Venice, on Ascension Day, in the state barge *Beventaur*, 'espoused' the sea by throwing into it a ring at the channel of Lido. This continued until 1795, when Napoleon conquered Venice and transferred her to Austria: the magnificent

Bucentaur was transformed into a guardship.

Other powers that claimed exclusive dominion in the sea were the Scandinavian states, which divided the Baltic between them; Denmark declared, further, that the seas between Norway and Iceland and Greenland belonged to her. Still more arrogant were the pretensions of Spain and Portugal. After the Portuguese, in the latter half of the 15th century, had made their way to India by the Cape of Good Hope and Columbus had discovered America, the pope issued a bull drawing an ideal line from the North Pole to the South Pole and passing a hundred leagues to the west of the Azores. All lands discovered west of this line were to belong to the Spanish crown, and all to the east of it to Portugal. These exclusive rights were rigorously enforced until the monopoly was broken by Drake on the part of England and by Heemskerk on the part of the Dutch. Selden has endeavoured to show that the sovereignty of the British sea existed before the Roman occupation, and was exercised by the Romans, and later by the Anglo-Saxons; but at a later date the real lords of the sea were the Northmen, whose fleets scourged every coast from the Arctic regions to the Mediterranean. The Norman conquest brought both shores of the Channel under the same crown; thus the Channel became 'the narrow sea.' For about four and a half centuries, until the loss of Calais in 1558, the command of the Channel was a powerful political instrument in the hands of England. At any time the commerce of other nations could be interrupted and pressure brought to bear upon them. It is this aspect of the sovereignty of the sea which is most insisted on in the poem *Libelle of Englyshe Polycye*, written about 1436. For this reason, and in order to 'keep the peace' of the sea and suppress piracy, the early Norman kings appointed wardens or guardians of the sea, afterwards known as admirals. An ordinance of King John in 1201 decreed that if the admiral or lieutenant of the king should meet any ships or vessels at sea which refused to strike and lower their sails at command, their crews should be reputed as enemies, and their ships and goods taken and forfeited; and foreign vessels were, in fact, taken into port by English men-of-war as early as 1402 for not lowering their sails at command.

More important was the claim of the Plantagenet kings to sovereign lordship and jurisdiction in the 'sea of England'—a claim

made between 1304 and 1307. It arose under certain provisions in treaties between Edward I. and Philip the Fair of France, and declared that the kings of England from immemorial times had been 'in peaceable possession of the sovereign lordship of the sea of England and of the isles within the same.' In formal documents in 1336 Edward III. referred to his royal progenitors as having been 'lords of the English sea on every side,' and after his naval victory over the French at Sluys he coined his famous gold noble (1344), on the obverse of which he is represented, crowned, standing in a ship, with a sword in one hand and a shield in the other—a symbol which was afterwards invariably regarded as representative of his power and sovereignty at sea. Elizabeth declared that the sea was free for the navigation and fishery of all nations, except for a small distance from the coast. Nevertheless in 1555 the Spanish fleet bringing Philip to marry Queen Mary received a broadside from the English admiral, Lord William Howard, for neglecting to lower the flag in his presence; and later, when Anne of Austria was on her way to Spain to marry Philip, Admiral Hawkins forced the Spanish vessels to show the same ceremony at Plymouth.

The real claims to the sovereignty of the sea began with the Stuarts. In 1609 James I. issued a proclamation forbidding foreigners to fish on the British coasts and seas without first obtaining his licence. This proclamation at once aroused the opposition of the Dutch States-general, and the proclamation was suspended, though the Dutch voluntarily agreed not to fish within sight of the Scottish coast. Charles I. declared himself to be lord of the surrounding seas, ruling over them as part of his realm and territory. No hostile acts between belligerents were to be allowed in the German Ocean or in the Channel; no other fleets, whether Dutch, French, or Spanish, were to be permitted 'to keep any guard' there, to offer any violence, to take prizes, or to search vessels; even the blockade of the opposite continental coast by another fleet—as Flanders by the Dutch or French—was prohibited, because that coast was washed by the British seas. On the other hand, the king of England would grant peace and security to merchant vessels passing through his seas and safeguard them from violence. The commonwealth was as decided as Charles had been in claiming the dominion of the British seas, and in 1652 the first Dutch war was precipitated by the historic en-

counter between Blake and Tromp regarding the ceremony of the flag. The alleged action of Tromp in tying a bundle of broom as a flag to his masthead, signifying his intention to sweep the narrow seas of all Englishmen, is now discredited. In the treaty of peace Cromwell required that the Dutch fleet passing through 'the British seas' should strike the flag and topsail. The pretext for the third Dutch war was again a dispute about the flag. The ensuing treaty stipulated for the striking of the flag to any vessel bearing the king's ensign in any of the seas between Cape Finisterre and Stadland in Norway. From this time the English pretension gradually died away, and after the battle of Trafalgar, when the naval power of Great Britain was supreme, the government omitted the arbitrary article. See Selden's *Mare Clausum* (1635), Sir John Burrough's *Sovereignty of the British Seas* (1686), Nicolas's *A History of the Royal Navy* (1847), Hannay's *A Short History of the Royal Navy* (1898); also TERRITORIAL WATERS, and Hall's *International Law* (1904).

Sowerby, JAMES (1757-1822), English scientist and artist, was born in London. At first he was a teacher of drawing and painting, and having studied botany, he was employed to execute plates for the *Botanical Magazine*, and thereafter devoted himself to coloured illustrations of botanical, zoological, and other scientific subjects. He published *English Botany* (1790-1814), with 2,592 coloured plates; *Coloured Figures of English Fungi* (1797-1815); *The Mineral Conchology of Great Britain* (1812-46); and similar works.

Sowerby, JAMES DE CARLE (1787-1871), English naturalist and artist, son of the above, was born at Stoke Newington, London, and followed the lines of his father's work. He helped to found, and became secretary of, the Royal Botanic Gardens (1838).

Sowerby Bridge, tn., W. Riding, Yorkshire, England, on the Calder, 2½ m. s.w. of Halifax, at termination of Rochdale Canal. The town has woollen mills, cotton factories, and engineering works. Pop. (1901) 11,477.

Sowing, of seed, is the method by which all the hardy annuals and biennials are raised. In the case of annual and biennial plants—such as sweet peas, mignonette, nasturtiums, convulvulus, nigellas, and the rest—the seed may be sown in the open borders or beds, if the soil be well dug and finely divided. It is advisable, however, to mix a little sand and leaf-mould with the soil, and after the seed has been sown to press the seed-bed,

either by the use of a roller or by patting it with the flat of a spade. This tends to promote the flow of a continuous supply of moisture from the deeper parts to the surface by means of capillary attraction. As, however, this also promotes a continuous loss of moisture by evaporation, the surface should be loosened by hoe or rake as soon as the young plants appear; indeed, in the case of the more deeply buried seeds, such as sweet peas, the surface should be slightly disturbed as soon as the sowing and pressing have been performed. In dry weather evaporation from the seed-bed may be checked by shading it with a screen placed about two feet above the surface. As a general rule, small seeds should be covered by a depth of soil about equal to their thickness, whilst seeds such as sweet peas should be sown two inches deep. Some perennials—such as columbines, campanulas, poppies, and primroses—may be sown in open beds; but as they are somewhat slower in germinating, it is best to sow them in shallow earthenware pans containing a mixture of loam, sand, and leaf-mould. The soil in the pans can best be kept moist by occasionally dipping the seed-pan in a vessel of water, being very careful not to lower it so that the surface of the soil is below the surface of the water. A sheet of glass may be placed as a cover to the seed-pan until germination takes place; but care should be taken not to 'damp off' the young seedlings through excessive moisture and insufficient air.

There is one great rule to be borne in mind in sowing all kinds of seed, and that is, *sow thinly*. Do not rely too much on subsequent thinning out, but allow space for development from the first. A certain proportion of seeds, however, nearly always fails to germinate, and a certain proportion of seedlings falls victims to disease and snails. Seeds of hardy plants may be sown at almost any time during spring, summer, or autumn. Most of the biennials and perennials may with advantage be sown in June, and transplanted to their flowering quarters in September. Annuals intended to bloom in summer or autumn should be sown in March, April, and May; whilst those intended to flower in the following year should be sown in August and September.

Sowing Machines. See IMPLEMENTS AND MACHINERY.

Sow-thistle, the popular name given to certain plants belonging to the composite genus *Sonchus*.

Soy, a bean, like the kidney bean, growing annually on a

small erect plant (*Soja hispida*), native from N. India to Japan. From it is made a sauce, by mixing the boiled beans with roughly ground wheat or barley, covered for twenty-four hours and allowed to ferment, salted, watered, stirred daily for two months, the liquid being then drawn off, filtered, and casked. It produces also an oil used in cattle-feeding and ground-fertilizing.

Soyer, ALEXIS BENOÎT (1809–58), French cook and practical philanthropist, was born at Meaux; came to England in 1830, and eventually became *chef* at the Reform Club, London (1837–50), where he made a great reputation. At the time of the Irish famine he was sent by the government to superintend the erection and working of public kitchens for the issue of rations, and he succeeded in reducing the cost by fifty per cent. On the outbreak of the Crimean war he was associated with Florence Nightingale in reorganizing the victualling of the army hospitals. He invented a military cooking wagon and (in 1849) a magic cooking stove, and published successful books on cookery—e.g. *The Gastronomic Regenerator* (1846), *The Modern Housewife* (1849), and *Shilling Cookery Book* (1854). See *Memoirs* by Volant and Warren (1858).

Spa, tn. and wat.-pl., prov. Liège, Belgium, 20 m. S.E. of Liège. The baths building encloses the Pouhon (chalybeate and carbonaceous), and several other springs are situated within $1\frac{1}{2}$ or 2 m. of the town. From this place is derived the generic name for a watering-place. Articles are made of painted wood. Pop. (1900) 8,192.

Space. See PSYCHOLOGY, DIMENSIONS, GEOMETRY.

Spadix. See SPATHE.

Spagnoletto. See RIBERA.

Spahi, a Turkish irregular cavalryman. With their almost untamed horses, the spahis were from 1326 a formidable body in the army of the Sultan, down to its reorganization by Molke in 1835. The French gave the name to bodies of native Algerian cavalry organized after 1834. The word is Persian, and is etymologically identical with sepoy.

Spain (*España*) occupies, with the exception of the kingdom of Portugal, the whole of the Iberian peninsula, extending from the Pyrenees and the Bay of Biscay on the N. to the Strait of Gibraltar on the S., and from the Atlantic on the W. to the Mediterranean on the E. The area is 194,783 sq. m., of which 64 per cent. is cultivated. The population numbers (1900) 18,618,086, of whom only 30 per cent. are able to read and write.

The position of the peninsula at the extreme S.W. of Europe, its isolation from the rest of the continent, and the broken and mountainous character of its surface, which give it a great diversity of climate, not only preserved the local peculiarities of its various racial inhabitants longer than elsewhere, but endowed the people, when they had become partially amalgamated, with many of the qualities of both the southern and the northern races. Powerfully imaginative, ardent, and impulsive on the one hand, they are grave, thoughtful, and tenacious on the other. Its climate offers a complete contrast to that of other countries of similar latitude. The N.W.—Galicia, for instance—projecting far into the Atlantic and on a parallel with Marseilles, is wet and fertile; the S.E. is excessively dry and torrid, artificial irrigation being necessary for cultivation; and the great central table-land, owing to its elevation, is bleak and arid, alternating between icy winds and parching sunlight. The main natural orographic barriers of the country are: (1.) The Pyreneic system, extending E. and W. from the province of Gerona to that of Galicia, and enclosing the region between that range and the Bay of Biscay. (2.) The Iberic system, which branches first towards the S.E. from the aforementioned range at about 4° W. long., and divides the valleys of the Duero (Douro) and Tagus from that of the Ebro; and thence (about 2° W. long.) runs due S. till it merges into the Sierra Nevada at 37° 40' N., and continues S.W. till the range is lost in the sea at Gibraltar, thus dividing the valleys of the Jucar and the Segura from those of the Guadiana and the Guadalquivir. From this N. and S. backbone there branch three nearly parallel ranges running from E. to W.—the first, the Guadarrama system, separating the valleys of the Duero and Tagus; the second, the Toledo and Estremadura system, those of the Tagus and Guadiana; and the third, the Sierra Morena, those of the Guadiana and Guadalquivir. The first political division of Spain was made by the Romans about 200 B.C.—namely, Hither Spain (Citerior) in the E., with Tarraco (Tarragona) as its capital, and Thither Spain (Ulterior), whose chief town was Cordova; and when the country became more settled Octavian (the future Augustus) in 29 B.C. made a fresh division—namely, Bética, which included Andalusia, Granada, and a portion of Estremadura; Tarraconensis, comprising the whole of the E. and centre of the country; and Lusitania,

containing Portugal, Galicia, and Leon. This last province, being the least settled and civilized, was ruled direct by the Roman emperor as a military territory. The principal cities which grew out of the Roman settlements, besides Tarragona, Granada (*Elvira*), Seville (*Hispalis*), Cadiz (*Gades*), and Cordova, were Badajoz (*Pax Augusta*), Merida (*Augusta Emerita*), Astorga (*Asturica Augusta*), Braga (*Bracara Augusta*), Lugo (*Lucus Augusti*), Leon (*Urbs Septimæ Legionis*), Saragossa (*Cesare Augusta*), and the former Carthaginian cities of Barcelona, Saguntum (*Murvi-dro*), and Cartagena. The prov-

is done. The E. and S. regions are mainly concerned with the production of fruit, wine, and olive oil, the principal ports of export being Valencia, Seville, Malaga, Cadiz, Alicante, and Almeria. Madrid, almost in the centre of the country, possesses little productive industry, but has grown rapidly both in population and in amenity during the last thirty years, owing to the railway system centring at that point. By far the greater part of the foreign trade of Spain is carried on with Great Britain and France, the proportions being 38 and 21 per cent. respectively. The total trade in 1904 amounted to

tional monarchy. The legislative power is vested in the Cortes (parliament) and the king. The Cortes consists of a Senate of about 360 members, one-half elected, and of a Congress of 431 deputies, elected in the proportion of one for every 50,000 of the population, with some specially elected. Of her once extensive colonial empire all that now remains to Spain are the Canary Islands and sundry small possessions on the N. and W. coasts of Africa, aggregating some 83,400 sq. m., with a population of 650,000. Military service for three years is compulsory. The peace strength of the army



Spain—Contours.

inces were subsequently subdivided for administrative purposes by the Romans; but until the Moorish domination of the peninsula the main plan remained without great change. The N. provinces abound in rich mountain pasture, and produce much maize, and in favoured districts good wheat. This region is, however, to a large extent industrial and mining, the whole of the Cantabrian range being especially abundant in minerals. The two main centres of export of minerals from this portion of the country are Bilbao, where an enormous business in hematite iron is done with England, and Oviedo. The centre of the textile industry is Barcelona, where also a large export trade in cork

£26,229,626 for exports, and £25,334,300 for imports. Fruit, wine, and minerals are the principal exports. Roman Catholicism is the state religion; the hierarchy consists of nine archbishops—Toledo (primate), Burgos, Granada, Santiago, Saragossa, Seville, Tarragona, Valencia, and Valladolid—and nearly fifty bishops. Protestants and other nonconformists may worship in private only. Primary education is by law compulsory; but the law is not carried out, as the high percentage of illiterates proves. Nevertheless there are universities at Madrid, Salamanca, Barcelona, Granada, Oviedo, Santiago, Saragossa, Seville, Valencia, and Valladolid. The government is that of a constitu-

is about 95,000 men; estimated war strength, 200,000.

See Carrasco's *Geografía general de España* (1861), Mingote y Tarazona's *Geografía de España y sus Colonias* (1887), Reclus's *Géographie universelle* (1879), O'Shea's *Guide to Spain and Portugal* (1895), Hare's *Wanderings in Spain* (1904), Baedeker's *Spain and Portugal* (1901), and Murray's *Handbook for Spain* (1898).

History.—The key to the history and development of Spain as a nation must be sought in the geographical position, physical conformation, and ethnological phenomena of the country. Situated at the extreme south-western point of the European continent, almost inaccessible by land except

at two points at either extremity of the Pyrenees, the Iberian peninsula received in every case the last wave of the successive influences which in turn invaded Europe from the ancient East. As return was difficult or impossible, each successive racial inundation, each successive type of civilization, had there to stand at bay, to fight, and finally to succumb to the dispensation that supplanted it. The physical conformation of the country (see geographical section) not only retarded racial amalgamation to a very great extent, but perpetuated the influence of primitive characteristics and traditions. The great diversity of climate,

country a short, dark-skinned, hirsute people, organized on tribal lines, and possessing a very strongly marked sense of individuality and local attachment. Whence these Iberians came is disputed. Some authorities claim them as a branch of the great Indo-European family; others believe them to be of cognate origin with the aboriginal North African tribes, whose descendants now inhabit portions of the Atlas region. Long before the arrival of the Phœnicians a great invasion of undoubted Celts took place across the western Pyrenees, and for ages they warred with the Iberian tribes. Eventually the two races (and

kinsmen the Carthaginians. The latter came to Spain, and repelled the Celtiberian tribesmen.

In the great Punic struggle with Rome Iberia furnished the best soldiers to the armies of Hamilcar and Hannibal on the one side, and to those of Gnaeus and Scipio Africanus on the other. After the ruin of the Punic power the victorious Romans dominated (205 B.C.) Spain. Under the Carthaginians the coast towns had grown greatly in population, civilization, and wealth; the Spanish galleys were the finest in the Mediterranean; and the people were eagerly receptive of all innovations which did not run counter to their traditions of local



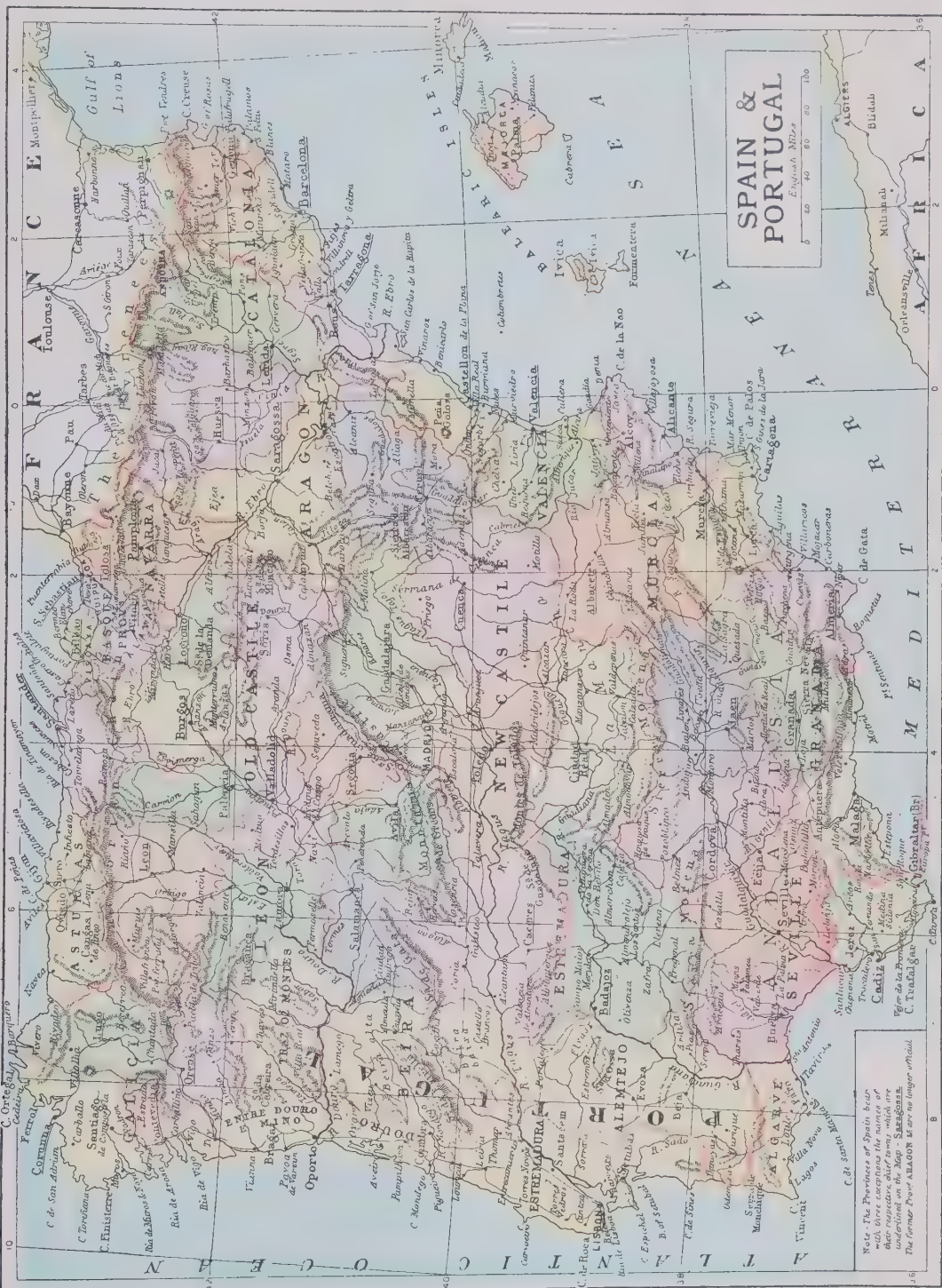
Spain—Annual Rainfall.

moreover, tended to keep distinct the institutions, the characteristics, and habits of the various regional populations; and all these influences together made Spain, until recent times, a bundle of jealous and unsympathetic units rather than a concrete nationality.

The recorded history begins with the establishment by the Phœnicians of the trading colonies on the south coast, especially at Gadeira (Cadiz), about 1100 B.C. Almost simultaneously Greek settlements were founded on the east coast, first at Rhodæ (now Rosas) and the Balears, and later at Emporæ, Dianium (Denia), and Saguntum. The settlers found in possession of the

probably a third race of aboriginal cave-dwellers, of which little is known) fused to a great extent on the central table-land; but the Celts remained almost pure in the north-west and west, as the Iberians did in the south and south-east. The influence of the Phœnicians was almost entirely confined to the material and civilizing effects of commerce, while the Greeks to some extent coloured the social and religious organization of the people. At length, about 500 B.C., the Phœnicians attempted to push their influence into the interior, and came into inimical contact with the less civilized tribes. The Phœnicians were forced to appeal for help to their

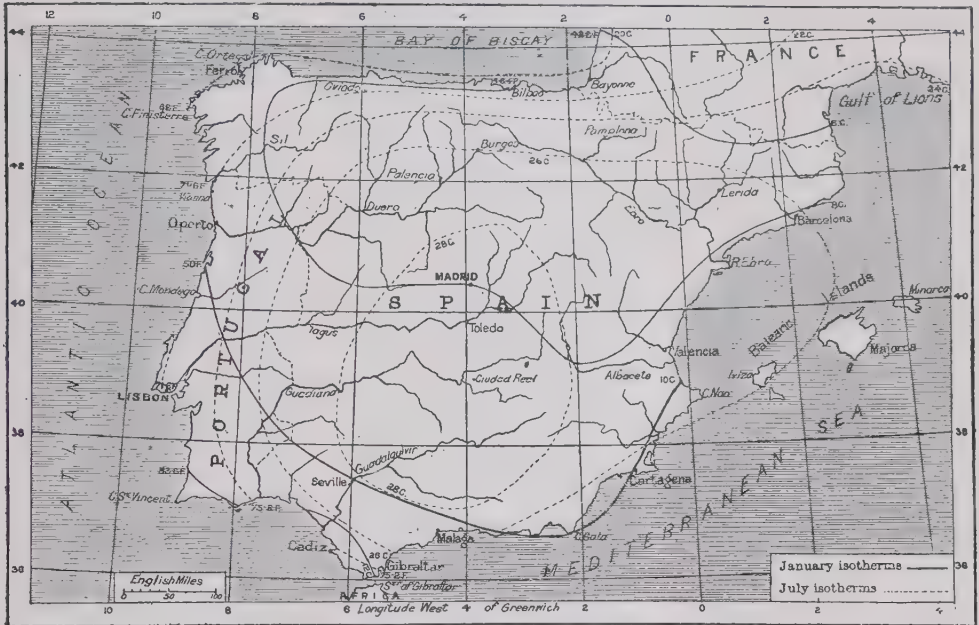
autonomy. But the Romans, true to their system of centralizing bureaucracy, governed the new dependency, as they governed the rest of their dominions, from Rome. But this method of government was utterly opposed to the sentiment of the natives, and large garrisons had to be stationed in the conquered districts in order to enforce Roman law and Roman taxation. Thus in the course of time a considerable mixed, Latin-speaking population grew up, who settled in separate colonies, which later became centres of Roman culture. Once a formidable federation of Celtic (Lusitanian) tribes almost wrested independence from the Romans. The leader of the revolt (151-140



B.C.) was Viriatus, a Lusitanian shepherd, who, after holding out for ten years, and beating all the generals that Rome sent against him, succumbed only to the knife of the hired assassin. With the fall of the heroic city of Numantia and the suicide of its brave Iberian defenders the hope of rescuing any portion of Spain from Roman control came to an end. The revolt of Sertorius (83-72 B.C.)—a Sabine by a Spanish mother—was raised on behalf of the party of Marius, who continued in Spain, then the most influential colony of Rome, the political conflict which shook the metropolis. For a time he was successful, organizing the

to receive a doctrine which appealed irresistibly to their individualistic instincts. With the division and corruption of the Roman empire Spain too became divided and corrupt; and when the barbarians swarmed across the Pyrenees at the invitation of one of the Roman claimants to empire (A.D. 409), they overran the country without resistance, softened as it was by Roman luxury and enervated by six centuries or more of Roman protection. Like locusts the Alans, Suevians, and Vandals devastated the land—the Alans spreading down the extreme east and west and on the central table-land, the Suevians establishing themselves

new cohesion and vigour into the chaotic government which had survived the fall of Roman bureaucracy, never succeeded in acclimatizing to any great extent their own governmental traditions in Spain. On the contrary, the Visigothic aristocracy, living apart and not intermarrying with the natives, became themselves to a large extent Latinized. Euric in 466 found that the councils of the Christian bishops, meeting usually at Toledo, had assumed the importance almost of a national parliament. The Visigoths, however, were Arians, and for a hundred and twenty years they strove in vain to force their Arian creed upon the mass of the



Spain—January and July Isotherms.

country with great ability; but he too fell by the dagger. Finally (45 B.C.) Caesar succeeded not only in trampling down in Spain the party of Pompey, but also in extinguishing the hopes of Iberian independence. Thenceforward Spain became an integral part of the Roman possessions. Trajan, Spanish born, and emperors such as Hadrian and Marcus Aurelius, gave new life to decadent Rome by introducing into her councils the more vigorous provincial element. Spanish authors—Seneca, Lucan, Martial, Quintilian—brought to Latin letters the exuberance of their race.

The advent of Christianity found in Spain a people avid

in Galicia, and the Vandals, prior to their migration to Africa, settling down for a few years in Betica. But Ataulf the Goth crossed (415) the Pyrenees ostensibly to reconquer Spain for the decadent empire, and thenceforward the Goth held sway, for the first forty years in the name of the Roman emperor, and afterwards independently, and ruled all Spain, except the Suevian north-west corner, from the Gothic capital of Toulouse. The governing idea of the Goths, or rather the Visigoths, was an elective military monarchy, upheld by landed armed chieftains speaking for themselves and their dependants; but the Visigothic monarchy, although introducing

Latin Spaniards. But the bishops and the national feeling were too strong, and in 589 King Recared summoned the famous third Council of Toledo, and solemnly renounced the Unitarian heresy. Thenceforward, until the fall of the Visigothic monarchy, Spain was a theocracy in all but name, with a sovereignty tending to become hereditary, the kings humbly receiving investiture at the hands of the bishops and ruling through the councils. This was resented by the Visigothic military chieftains, who still claimed the right of freely electing the monarch. At length, after the nobles had chosen one of their number, Roderic, king, the representatives of the monarch appointed by the

churchmen, unable to withstand alone the force of the Visigothic aristocracy, invited Count Julian, the Eastern Roman emperor's governor of Ceuta, to send across the strait a force of Africans to aid the ecclesiastical Spanish faction. This was one of the great crises of history. The Saracens, under the leadership of Tarik, crossed the Strait of Gibraltar in thousands, and near the junction of the Guadalquivir and the Guadalete Roderic fell, and his Visigothic host melted away (711). The Jews, whom the ecclesiastical councils had persecuted, everywhere made common cause with the invaders, and within two years virtually all Spain bowed beneath the rule of the infidel.

The new conquerors left the Spaniards in full enjoyment of their religion, social usages, and local autonomy, and were gentler masters than the Visigoths had been. Almost the only permanent trace left of the domination of the latter in Spain was the code of laws called the *Lex Visigothorum*, which subsequently became the foundation of the law of Christian Spain. For the first forty years after the Moslem conquest Spain was ruled in the name of the caliph of Damascus by Arab or Saracenic emirs. After the overthrow of the Ommyad dynasty of the caliphs of Damascus by the Abbasides and the transfer of the caliphate to Bagdad, the only surviving prince of the fallen dynasty, Abdur-Rahman, fled to Spain, and there assumed independent sovereignty (755). Under his vigorous rule Islamic Spain became united and strong. In an attempt to subdue the survivors of the Visigothic force the Arabs were crushingly defeated in 718 at the semi-legendary battle of the cave of Covadonga, and the tiny mountain principality of which Pelayo then became the head was the nucleus out of which the Christian kingdom of Asturias was subsequently organized. On the east of the Pyrenees another Christian advance was made almost at the same time by a powerful force from Aquitaine. Catalonia having been conquered (800-801), was held, first as tributary to Aquitaine, and subsequently (after 811) as an independent dominion by its own counts. For the next two centuries Spain may be roughly divided into two portions. All north of the Ebro—the Guadarrama mountains and the range that separates the valleys of the Douro and the Tagus—was Christian; south of that line was Moslem. There was as yet no persecution on the Moslem side; marriage between the races was common; the skill,

wealth, and elegance of the Arabs were agreeable to the Christians amongst whom they lived; and the mass of the population was prosperous. But the priests and leaders of the Asturian kingdom fomented the religious mysticism and zeal of the Christians. The body of the apostle Santiago was opportunely discovered early in the 9th century; saints and angels were declared to have led the Christian bands to victory. Fanaticism on the one side was answered by fanaticism on the other. The over-refinement and luxury of the Arab capital, Cordova, under the successors of the first Ommyad caliph aroused the scorn of the bigoted African Moslems. The Christians deliberately sought martyrdom by insulting the faith of Islam (850); and thus gradually religious fanaticism and persecution embittered the situation. Racial disaffection and discontent drove the Moslems into revolt, until the Caliph Abdur-Rahman III. (912-961) temporarily subdued all the jarring elements, and once more unified Islam. Meanwhile in the kingdom of Asturias the priests had not been able to re-establish the purely theocratic system. But the sovereigns of the Frankish state of Catalonia and the little Basque mountain kingdom of Navarre were political chiefs, elected by their peers with strictly limited powers, and with no trace or pretence of divine warrant or sacerdotal privilege. These growing obstacles to ultimate Christian unity were increased by the elective traditions of the Visigothic monarchy, which led successive kings to bequeath separate realms to their several sons, and so to weaken the Christian cause by division and regional jealousy. Thus when Alphonso III., king of Asturias, abdicated in 909, he divided his realm into three; and this subsequently allowed the great Moslem minister Almanzor to drive the Christian power back again to its original mountain stronghold, to lay waste Leon and Galicia, and to make the Asturian king a vassal of the Moor (981). Even Barcelona fell before Almanzor (985). The taste for culture and elegance in Cordova became a craze both with the Arabs and with the Jews and Mozarabes (Spaniards of Christian faith and descent living in Arab territories); and although this tendency contributed largely to the ruin of the Moslem caliphate in that city, it rendered priceless service to civilization by keeping alive in translations the works of the Greek philosophers, and afterwards by transmitting the culture and science of the ancients to the modern world.

The anarchy that followed the

death of Almanzor enabled the Christians again to advance their borders, and the period is marked by the assembly (1020) in Leon, then the premier kingdom, for the first time of a great legislative council of bishops and nobles (the former preponderating). From the earliest times the rulers of Catalonia and Navarre (and later of Aragon) had been bound to summon their nobles to conference; but this legislative assembly of Leon may be regarded as the direct successor of the ecclesiastical councils which had been paramount during the last years of Roman Visigothic rule. The constant division and reintegration of the petty kingdoms, the jealousies engendered by diversity of racial traditions and systems, and the topographical causes already referred to kept the Christian realms constantly at war with one another. The border nobles, especially the counts of Castile, upon whom the lion's share of the fighting fell, were impatient of the control of the central sovereign in Leon, and in order to strengthen themselves they accorded charters of great liberality to the vassal towns which sprang up in the conquered territory, or which remained peacefully under Christian rule when the Moors were driven back. Thus the autonomy of the towns—always a cherished tradition of the Iberian race—grew stronger and stronger. The murder of the last count of Castile in 1027 enabled Sancho the Great of Navarre to seize the county in right of his wife, a Castilian princess; and on the death of Sancho (1035) Castile, in future a kingdom, fell to his second son, Fernando I., who succeeded two years afterwards to the kingdom of Leon in right of his wife. Although Castile and Leon were on more than one occasion divided again, their interests tended to unity, as their traditions were the same, both having sprung from the Asturian advance; and in 1230 both realms finally fell by inheritance to Fernando III. (St. Fernando), and were not again separated. Under Alfonso VI. of Castile and Leon (1072-1109) a great forward Christian movement was made. The Moslem caliphate of Cordova had fallen (1031), and had been succeeded by twelve petty kingdoms, each jealous of the others, and appealing in turn for aid to the strongest power in the peninsula, Castile and Leon. In 1085 Alfonso VI. took possession of Toledo, and made it the Christian capital, the Moorish king of Toledo being maintained in the kingdom of Valencia as a vassal of the Christian. The great Castilian free-lance, Ruy Diaz de Bivar (El Cid), who fought now on one side

and now on the other, seized Valencia for himself, and held it against all comers until his death (1099). In the meantime a wave of Moslem fanaticism had swept over N. Africa, and a great host of the puritans of Islam (the Almoravides) swarmed into Spain. At the battle of Zalaca (near Badajoz), in 1086, Alfonso VI. met with a complete defeat, which for a time stayed the Christian advance, and allowed the Almoravides to subdue the weak, effeminate Arab kings. Everything that was beautiful and artistic was sternly destroyed by the Moslem puritans, and Islamic Spain became a province of the theocratic empire of Morocco.

With the establishment of the Christian capital at Toledo a great change was worked. By the influence of the French archbishop of Toledo, Bernard, and of the French queen of Castile and Leon (Constance of Burgundy), the Roman missal was adopted instead of the Gothic ritual, and thus a great step was made towards the submission to the Roman pontiff of the Castilian church, with its national sacerdotal traditions. But more far-reaching still was the policy of Alfonso VI. in inducing the Moorish inhabitants of the conquered kingdom to remain peacefully under his tolerant rule. He encouraged marriage between the races, and his policy was powerful in introducing into the Christian kingdoms a large admixture of Moorish blood, culture, and taste. This was aided by the fanaticism of the Almoravides, which caused a great exodus from the Moslem territories of the Mozarabes and Christians of mixed blood, who were welcomed by Alfonso VI., and established in northern and central Spain. It was the Latin dialect that these people brought with them (1085-1100) which finally superseded the Galician and Provençal forms of Latin, and from which developed the modern Castilian. Meanwhile the towns successfully withstood all attempts upon their rights, and finally, by means of a confederacy, were able not only to become the leading power in the state, but to oust the nobles entirely from the government. The new political influence was first felt in the reign of Urraca of Castile, daughter of Alfonso VI., who was at war with her husband, Alfonso the Battler of Aragon. Discontented with the light behaviour of the queen, a confederation of towns proclaimed her infant son by her first husband, Raymond of Burgundy, king of Galicia, under the title of Alfonso VII. This led Alfonso VII. (the emperor) generally to side with the towns as against

the nobles when he succeeded his mother as ruler of Leon and Castile (1126). When in 1134 Alfonso the Battler of Aragon was killed in battle, leaving no issue, his crown passed to his brother Ramiro the monk, who three years afterwards abdicated in favour of his infant daughter Petronilla. As, however, a military elective monarchy such as Aragon could not be ruled by a woman, Petronilla was married to Ramon Berengar, count of Barcelona, sovereign of Catalonia, and thenceforward Aragon and Catalonia were united under one crown, though each state retained its autonomy and separate institutions. The same period saw the rise (1094) of Portugal as a separate state, first as a tributary county to Castile, granted by Alfonso VI. to Henry of Burgundy, his son-in-law, and later (1140-3) as a separate kingdom.

Meanwhile the Almoravide sect had become infected with the soft luxury of the Spanish Moslems, and their dominion became broken up into a great number of petty independent states, which finally fell before another great invasion of fanatics from the Atlas tribes (the Almohades), who between 1145 and 1149 subdued the whole of Moslem Spain, and made it subject to the mahdi of Morocco. Thenceforward cruel oppression, and even extermination, were the fate of Jews and Mozarabes under Moorish rule; and Christian Spain received great numbers of refugees, who brought with their mixed blood, their Oriental tastes, habits, and culture, a fierce hatred of the Moors who had driven them from their homes.

The crowns of Leon and Castile were finally united by the marriage of Berengaria, daughter of Alfonso III. (VIII.) of Castile by Eleanor Plantagenet, to Alfonso IX. of Leon (1195). The fruit of this marriage was St. Fernando (Ferdinand) III., who succeeded to the united kingdom in 1230. The Almohade power had been broken by Alfonso VIII. at the great battle of Navas de Tolosa (1212), and during the reign of his grandson, Fernando the Saint, the Christian conquests were pushed down to the Moorish capital, Cordova (1236), and to Seville (1248). Simultaneously with this the great and vigorous king of Aragon, Jaime I. (the Conqueror), possessed himself of Majorca (1229) and Valencia (1238); and the Moslem territory in Spain was thenceforward confined to the kingdom of Granada as a tributary of Castile. The long reign of the masterful and unscrupulous Jaime I. was a trial of strength between the royal power and the forces of feudalism. Be-

fore this the nobles had called into their national councils representatives of the gentry, clergy, and citizens (1133) to withstand the encroachments of the crown; but Jaime I. waged war until the end of his life (1276) against the greater feudal nobles, whose power he checked; and though feudalism on one occasion (1288) again obtained the upper hand by the extortion of the Privilege of Union, its power waned before that of king and parliament, and the institutions of Aragon became representative of all classes. It was at this period that the adaptation of the old Gothic Roman law code to the modern spirit was undertaken both in Aragon (1247) and in Castile: the Castilian *Siete Partidas*, ordered by St. Fernando and formed by his son Alfonso the Learned, was recognized for centuries as the foundation of revived European jurisprudence. Although drawn up by Alfonso the Learned (1284), it was not promulgated officially as the national law until 1348. To the literary ardour of Alfonso the Learned the world owes much. To him is largely due the translation into modern tongues of the Greek classics and Eastern scientific works, which the Spanish Jews and Moslems had rescued from oblivion in Hebrew or Arabic. To Alfonso also is to be credited the final victory of the Castilian tongue as the national speech over Galician, Portuguese, and Catalan (or Provençal). But his vague ambitions, his weakness, and his bookishness encouraged the nobles of Castile to side with his rebellious son Sancho, in the hope of regaining the power which was fast drifting from them. Sancho, on his accession (1284), disappointed the nobles, and a civil war ensued, which continued after his death (1295) against his infant successor Fernando IV. and the regent Maria de Molina. It was at this juncture that a great confederacy of self-governing towns banded together for mutual defence and support; and their representatives, meeting for the discussion of common interests, developed rapidly into a national Cortes, from which nobles and priests were eliminated. The struggle between the forces continued through the reigns of Fernando IV. and his son Alfonso XI. (1312-50), the sovereigns and regents usually favouring the towns. The accession of the boy king Pedro (1350) seemed a good opportunity for the nobles to make one final attempt to assert their power. The violent and tyrannical character which gained for Pedro the name of the Cruel aided the nobles; they chose as their puppet

Henry of Trastámara, illegitimate son of Alfonso XI. The war which ensued between the half-brothers was complicated by the participation of England on the side of Pedro, and of France and Aragon on that of Henry. With the murder of Pedro the Cruel by his half-brother Henry (1369), and the accession of the latter, the nobles obtained the upper hand; but though the weak king distributed fiefs liberally amongst them, he durst not entirely alienate the towns, the chief power in the realm that could protect him against the numerous claimants to the crown, and especially against the Plantagenet English princes, who had married the two daughters of Pedro the Cruel. For the next hundred years, under the Trastámara kings—Juan I. (1379-90), Henry III., who married Catherine of Lancaster (1387), Juan II. (1406-54), and Henry IV.—the 'leagues' of nobles reduced Spain to complete anarchy outside the walls of the chartered towns. The court, especially during the long reign of Juan II., became the abode of extravagant chivalry, poetry, and splendour, which set a lasting mark upon the habits of all classes. The towns still managed, thanks to their unity (Hermandad), to withstand the open infringement of their rights, though the gradual introduction by the crown of the nominative system of appointing judicial and municipal authorities, and the participation of the nobles in the internal government of their towns, were the first marks of the decadence of the municipal power. Matters came to a crisis during the reign of Henry IV. (the Impotent), who succeeded to the throne in 1454. He had sided with the nobles against his father, Juan II.; and his lavish grants when he became king not only aroused the indignation of the towns, but excited the jealousy of the nobles. His successive favourites, Pacheco, Marquis de Villena, and Beltrán de la Cueva, headed antagonistic factions; and after a period of complete anarchy the factions succeeded in obtaining the recognition of the king's half-sister Isabel as his heir, and the disinheritance of his doubtfully legitimate daughter (called in derision Beltraneja). Isabel had married secretly, and against her brother's will, Fernando, the only son of Juan II. of Aragon and Sicily (which island had fallen to the house of Aragon two hundred years before by descent and conquest).

On the death of Henry IV. of Castile (1474) Isabel and Fernando ascended the throne of Castile, and five years afterwards the death of Juan II. of

Aragon brought the whole peninsula, except Granada and Portugal, under the rule of the same monarchs. The history of modern Spain may be said to commence at this point. The first step of Isabel was to restore law and order in Castile. Appealing first to the towns, she formed by their aid a powerful militia, called the Santa Hermandad, which enabled her to raze the castles of the plundering nobles. She cancelled the lavish grants given by her predecessors, and thus made the nobles dependent upon her good will. She reorganized the judicial and administrative systems; and when by these means she had become strong enough, she and her husband set to work to lessen gradually the elective powers of the municipalities. The first need, for Fernando especially, was to obtain the united strength of all Spain for the furtherance of Aragonese aims of expansion in the Mediterranean. The Castilians were jealous, and had aims of their own towards the conquest of Granada, and perhaps Morocco, and the reabsorption of Portugal. Fernando and Isabel, with their great minister Ximenes, deliberately adopted religious exaltation, the persecution of the minority by the majority, the consolidation of the latter by bigotry, as the link to bind all their peoples together. The Inquisition was formally established in Castile in 1481, and in that year two thousand Jews were burned in Andalusia alone for heresy. To aid the religious revival, the last Moorish stronghold in Spain, Granada, was besieged and captured in January 1492; and in the same year the new continent of America was discovered by Columbus, under the auspices of Isabel. The prospective conquest of pagan lands for the Cross still further inflamed Spanish bigotry. If Aragon was to dominate Sicily and Naples, France must be dwarfed; and to attain this object the king devoted his life. By papal warrant he seized for Castile the kingdom of Spanish Navarre (1515), which by marriage had fallen to a French dynasty. He thus succeeded in bringing his late wife's kingdom into enmity with his own enemy, France. He had married his daughter Joanna to Philip, the emperor's son and heir of Flanders, Holland, and Burgundy, and thus checked France on the east and north. His daughter Catherine was married to the heir of England, in the hope of keeping the Tudors in his interest; and his eldest daughter, Isabel, was wedded to the heir of Portugal, in the hope of unifying the peninsula. But on Fernando's death (1516) the united crowns of

Castile, Leon, Aragon, Catalonia, and Spanish Navarre fell to Charles, son of Joanna, better known as the Emperor Charles V. Charles was practically a for-eigner in Spain, and when, in 1519, he summoned the representatives of the towns in Cortes unconstitutionally and extorted a money vote from them, the commons revolted. The nobles at first endeavoured to make use of the revolt for their own ends, but their power was now broken; and when the commons were defeated at Villalar (April 1521), the crown was the sole gainer. Thenceforward Spain gradually became an absolute despotism, the power of the towns dwindling, until finally their representatives were summoned merely to swear allegiance to a sovereign and his heir. During the whole of the reign of Charles, Castile was reduced to ruin and penury by the emperor's continued demands upon her, whilst her population was drained of the best men to fight in the wars of Central Europe, and to join in the mad rush to America. Sick at heart, Charles laid down the burdens of government (1556), handing them to his narrow-minded, secretive, conscientious, laborious son Philip. The empire passed to Charles's brother Ferdinand; but Flanders and Holland remained under the rule of Philip of Spain, and ruin was the result. For centuries England and the possessor of Flanders had made common cause against the alliance of France and Scotland. Philip inherited with Flanders the need for friendship with England and hereditary enmity with France; but with a Protestant England, ruled by an excommunicated queen, it was difficult for him to be friendly as against Catholic France. The revolt of the Dutch Protestants against him, and the aid given to them by Elizabeth, increased the difficulty. The whole of his long reign (1556-98) was occupied in endeavouring to reconcile this national difficulty; and he exhausted every expedient, from marriage (to Mary Tudor, 1554) to murder (Babington conspiracy, 1586), to make England a Catholic ally of Spain. The defeat of the Armada (1588) marked the first disillusionment of the Spanish nation in its belief in its sacred mission. Industry had been crushed by foolish attempts to keep down prices, by the burden of constant wars, by unwise fiscal measures, and by the relegation of labour to descendants of Moors and Jews, whilst the pure-blooded Catholics flocked to the political wars which they regarded as crusades. Fields were untilled, towns deserted, whole populations starving, and

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Views in Spain.

1. Segovia: the Alcázar and cathedral. 2. Cordova. 3. Burgos: tomb of Don Juan II. and Isabella of Portugal (Miraflores). 4. Toledo: the cathedral. 5. Valladolid: doorway of Church of St. Paul. 6. Cadiz: general view. 7. Murcia. 8. Saragossa: the cathedral. 9. Granada: the Court of the Lions, Alhambra.

the king himself (Philip III.) was forced to send officers from door to door in his capital to beg for means to maintain his own household. With this universal penury there existed an overpowering craze for extravagance and display on the part of all classes, and a determination to live if possible by the efforts of others. Philip III. (1598-1621) was dominated by greedy favourites and besotted churchmen; his people were vain and ignorant; and in the general belief that the poverty of the country arose from the frugality and laboriousness of the only people who worked—the descendants of the Mozarabes and Moors—a decree was issued (1609-10) expelling from Spain all people of known Moorish descent. Half a million of the best citizens of the country were hounded out, their property being confiscated to the idle classes; and from this blow the country never fully recovered. Thenceforward to the end of the century the decadence was rapid and unchecked. Philip IV. (1621-65), the poet, dilettante, and profligate, whom Velasquez painted from youth to age, was powerless to stay the decline. The Cortes of Castile was now effete. The peoples of the various autonomous states had lost the bond that had for a time held them together, and attempts by the king's favourite, Olivares, to assimilate the institutions of Aragon, Catalonia, Valencia, and Portugal (which had been captured by Philip II. in 1580) with those of Castile caused a series of devastating civil wars, in which the independence of Portugal was regained (1640). Notwithstanding her decadence, Spain was fighting with France in Central Europe and with Flanders during the whole of the Thirty Years' war; and the treaty (1648) of Münster (Westphalia), by which Spain recognized Dutch independence and that of the Pyrenees (1659), left Spain stripped of power, prestige, and resources. During the whole of the wretched reign of Charles II. (1665-1700) the decline continued unabated. The king was a semi-idiot, and died of senile decay at thirty-seven. Around his deathbed there raged endless intrigues for the succession, claimed respectively by Austrian and French princes as descendants of the female branches. In the seven years' war of the Spanish Succession, which ensued upon the king's death, all Europe took part (England on the side of the Austrian claimant), and Spain itself was swept from end to end by civil war. At length, by the treaties (1713-4) of Utrecht and Rastadt, Philip V., the grandson of Louis XIV. of France and great-grandson of Philip IV. of

Spain, was recognized as king of Spain. Everything was changed by the introduction of French culture, modern finance, and vigorous administration, and for a time Spain appeared renescent. Unfortunately Philip V. married as his second wife the ambitious Elizabeth Farnese (1714), who was allowed to keep Spain at war continually for many years in order to win Italian sovereignties for her sons. Philip was succeeded (1746) by his only surviving son by his first wife, Fernando VI., who brought peace and some measure of prosperity to Spain. But the country was still ignorant and priest-ridden—a century behind the rest of Europe. The autonomous Aragonese parliaments had all disappeared in the great war of succession (1714); the town councils, though now mainly nominative, were the only surviving framework of the ancient popular governments. On the death of Fernando VI. (1759), Charles III., king of Naples, the eldest son of Philip V. by Elizabeth Farnese, ascended the Spanish throne. He was a man of vast energy, enlightened mind, and an education tinged by the prevailing philosophic French thought of the time. Shocked at the backward condition of his people, he used his despotic power freely to force reform and enlightenment upon them. They were loyal and submissive; but the old tradition of Spanish superiority over the rest of the world remained, and though at the king's bidding the outer face of the country was changed, his reforms never penetrated beneath the surface. Public works, roads, canals, subsidized factories, academies, and institutions sprang up all over Spain; a great edifice of public credit was devised to pay the vast sums needed; but when the king died (1788) reaction set in, and under his weak, uxorious successor, Charles IV., collapse came, and the old-fashioned Spaniards, ignorant and vain as ever, gloried in the failure. The wife of Charles IV. (Maria Louisa of Naples) imposed upon her husband an ignorant, foolish young man with whom she was in love, Manuel Godoy (afterwards Prince of the Peace), as prime minister and generalissimo of the army and navy. Godoy was beguiled by Napoleon, by a promise of principalities for himself, to allow the French army to march through Spain (1808) to conquer England's ally Portugal. When it was too late the Spanish people saw how they had been tricked, and the Peninsular war ensued, Charles IV. abdicating at Napoleon's bidding in 1808. Whilst Charles's son and heir Fernando was a prisoner in

France and foreign armies covered the country, a Cortes of extreme politicians met at Cadiz (1812) and devised a new constitution, completely at variance with old Spanish traditions. This Fernando VII. repudiated on his return to Spain in 1814; and though he was forced by a revolution to accept it in 1821, he reasserted his despotic power by the aid of French bayonets in 1823. When he died, in 1833, he left his infant daughter Isabel II., under the regency of his wife Maria Cristina of Naples, the injunction to maintain intact all the old regal prerogatives. It was almost impossible for her to do this, because the whole Conservative party had rallied to Don Carlos, the late king's brother, who claimed under the Salic law, and the queen could only hope to reign by the support of the Liberals whom Fernando VII. had persecuted and banished. A long civil war ensued, in which Don Carlos was beaten; but the impossibility of reconciling the despotic leanings of the queen with the democratic views of the party which upheld her produced a period of turbulence, military *pronunciamientos*, and civil revolts, which culminated with Prim and Serrano's successful revolution of 1868, and the flight of Isabel II. to France. After six years of violent experiment, a limited monarchy under Amadeus of Savoy (1870-3), Duke of Aosta, three different types of republic, and a military dictatorship, the only son of Isabel II. was restored in 1875 as Alfonso XII. A new moderate constitution was adopted, which with some reform still exists, and the country has remained for the last five-and-twenty years fairly tranquil. The death of Alfonso XII., at the early age of twenty-eight, in 1885 threw upon his widow, Maria Cristina of Austria, the burden of the regency (till 1902) for her then unborn son, Alfonso XIII., the present king (born May 1886). During her regency the material progress of the nation was considerable, and the financial condition became more hopeful. Owing to the bad faith of the Conservative party (1879), the promise made by Martinez Campos of reforms in Cuba was broken, and the secession of the colony became inevitable. All that was left of the old Spanish empire of the West was lost in the consequent war with the United States in 1898, and Spain was free of what for years had been a burden to her. The loss of the protected colonial markets, however, greatly dislocated manufacturing interests, particularly in Catalonia, where the old separatist tendency is still strong. In

May 1906 King Alfonso married H.R.H. Princess Victoria Eugenie, daughter of Princess Henry of Battenberg, the youngest sister of King Edward VII.

See Burke's *History of Spain* (1900); Martin Hume's *Spain, its Greatness and Decay* (1897), and *History of Modern Spain, 1788-1898* (1899); Watt's *Spain, Story of the Nations Series* (1893); S. Lane Poole's *The Moors in Spain, Story of the Nations Series* (1886); Salvani's *España á fines del Siglo XIX* (1891); Dozy's *Histoire des Musulmans de l'Espagne* (1861); and Meyrick's *The Church in Spain* (1891).

Language and Literature.—Of the language spoken by the Iberian and Celto-Iberian tribes in Spain prior to the Roman domination nothing remains but a few undecipherable inscriptions on coins current towards the end of the Greek and Carthaginian periods. It has been suggested that the ancient Basque tongue, still spoken on the slopes of the western Pyrenees, may be a survival of the Iberian language; but the balance of evidence is in favour of its being the remains of a still earlier form of speech used by the aboriginal inhabitants. In any case its influence upon the formation of the modern Castilian has been so small, except perhaps remotely to affect the pronunciation of Latin, that it may be disregarded. After the downfall of the Punic power left the Romans masters of Iberia, they speedily impressed their speech as well as their manners and dress upon the subject races. The Roman patrician city of Cordova was famous for its school of poets. The two Senecas, Lucan, Martial, Quintilian, Columella, and Pomponius Mela were all Spaniards. The barbarians who swarmed over the Pyrenees and spread through Spain (409) left no linguistic traces, and the Goths adopted the Latin speech. The Latin-Spanish churchmen, St. Isidore and others, who monopolized the culture of their day and country, continued the linguistic debasement of the medium in which they wrote. But after the Arab domination it looked for a time as if Arabic was destined to be the speech of Spain. A craze for the culture of learning and letters dominated the caliphate of Cordova. Libraries, unrivalled elsewhere in the world, gave opportunities for the acquirement of learning to Arab, Jew, and Christian alike; and before the end of the 9th century Arabic, at that time a far more flexible and complete language than the bastard Spanish-Latin of the churchmen, became the common speech of the Christians living in Moorish

Spain. But under the influence of the Christian priests Spanish-Latin gained ground again, though it acquired features of pronunciation, construction, and etymology distinct from the original Spanish form spoken by the population of the Christian kingdom in the north-west (Galicia), and from the Romance form of Latin, which had become the speech of the reconquered north-eastern principality (Catalan). For four centuries literature flourished exceedingly in Moslem Spain. Jews and Arabs vied with each other in philosophy, poetry, and science. Avicbron the Jew in the 11th, and Judah ben-Samuel the Levite in the 12th century, were famous as poets throughout Europe; and the Arabs Avempace (d. 1138) and Averrhoës (d. 1198) handed down to modern Europe adaptations of ancient philosophy which held the field until the time of Luther. The Spanish Aristotle, the Cordovan Jew Maimonides (d. 1204), led the way to a rationalistic interpretation of the Scriptures (especially of the Talmud); and all the sciences, from agriculture to astronomy, were cultivated by Moors and Jews of Spanish birth. The Eastern fashion of casting philosophical and other books into the shape of didactic apoloques, which Spain transferred to the rest of mediæval Europe, came from her Moslem scholars. On the spoken language itself the Arabic influence was limited to the introduction of a considerable group of words, mainly technological, legal, and official. With the great forward movements, both from Aragon and Castile, in the 13th century the Latin languages became supreme. The final struggle was between the three Latin dialects themselves. In the Castilian kingdom, until the end of the 13th century, Galician was the polite and literary tongue; while in Aragon the Catalan, or the more literary form of Romance called Lemousi (Limousin), was the usual speech (as it still remains in Catalonia and Valencia). The great incursion of French troubadours and jongleurs into Spain—especially in Aragon—in the 12th and 13th centuries not only acclimatized the Provençal *chansons de geste*, but also made Lemousi the fashionable literary language, which for a time, even in Castile and Leon, threatened the supremacy of Galician. In the latter idiom Alfonso the Learned wrote his *Hymns to the Virgin* and other early verse; but before the end of his life (1284) he had finally adopted the Latin dialect of the Mozarabes, which had already been employed in the *Poem of the Cid*, and by St. Ferdinand in

a decree to the conquered Cordovans. The host of books, poems, translations, chronicles, scientific treatises, and above all the national code of laws, the *Stete Partidas*, which issued from the study of the king and his learned colleagues, converted a rude dialect into a noble and cultured language, Castilian. Thenceforward pure Galician and its sister Portuguese receded to provincial idioms, while Catalan or Lemousi remained confined to the peoples of Romance or Provençal descent on both sides of the Gulf of Lions. The form adopted for composition up to the early 14th century was mainly the proverb and apologue, either in prose or in verse. A new influence in literature was felt about 1340 with the satirical works of the Rabelaisian archpriest of Hita, Juan Ruiz, whose glib, abundant verse, cynical, immoral, and witty, threw somewhat into the shade the didactic apoloques that had preceded them. A Castilian prince of the royal house, Juan Manuel (1282-1347), followed with tales of *Count Lucanor*, which marks the transition from the sententious maxim to the story of adventure. These short tales served as a model for similar writing for many years afterwards, and Boccaccio, Chaucer, and even Shakespeare borrowed some of the plots. Nevertheless his contemporary, the Jewish rabbi Sem Tob, produced endless quatrains of *Moral Proverbs* of Eastern or Biblical origin. Pedro Lopez de Ayala, the chronicler of Pedro the Cruel and his brother (1332-1407), turned the dry chronicle into moving history; and the craze for writing history and adventure which seized upon Spain in the 15th century was largely due to this new departure. The same writer showed his originality in another direction, in *Kimado de Palacio*, a savage satire upon the social vices of the age. The influence of Dante and Petrarch began also to be felt in Spain. Enrique de Villena (1384-1434), the Marquis de Santillana (1398-1458), and Juan de Mena (1411-56) widened the scope; and though their writing continued pedantic and didactic, the folk-story, the popular episode, the witty retort gradually overshadowed the moral they were supposed to enforce. The writing of true chronicles soon degenerated into the relation of exaggerated adventure as the personal element was magnified. From this to the inflated tales of chivalry was but a step. Some time in the 14th century a Portuguese, João de Lobeira, or another, had written the tale *Ama-dis of Gaul*, and by the middle



*King Alfonso XIII. of Spain and his Queen (née Princess Victoria Eugénie Julia Ena of Battenberg).
(Photo by Hughes & Mullins.)*

of the 15th century this had gained in Spain a popularity which bore all before it. A perfect deluge of imitations was the result, each more extravagant than its predecessor, until the immortal satire of Cervantes swept away the whole brood in inextinguishable laughter. But whilst the vogue lasted it profoundly influenced Spanish life and thought—made men impracticable visionaries, inflated personal pride, promoted display, and left profound traces upon the national character. Whilst this vicious course was being followed by chronicle, the more healthy influences of Italian verse continued to grow, and social satires, such as the anonymous *Coplas of Mingo Revulgo* and the *Coplas of Jorge Manrique* (1412-91), foreshadowed the coming supremacy of Spanish dramatic presentation of incident. The introduction of printing into Spain (1474) gave a further impetus to the literary revival, and thanks to Boscan (?1490-1542), Garcilaso de la Vega (1503-36), and Diego Hurtado de Mendoza (1503-75), the graceful Italian forms of verse, flexible and elegant, ended by routing completely the stiffer Castilian eight-syllable line. Thenceforward for sixty years a flood of brilliant, glib, facile verse flowed from Spanish pens—pastorals, odes, sonnets, lyrics, and, above all, dramas—and Spanish poetry reached its highest excellence. The bent of the people had always been dramatic. The representation of sacred dramas in churches had, as early as the time of Alfonso the Learned, become so popular and irreverent as to cause scandal. Then came the representation of simple episodes, eclogues, or proverbs, and the playing of masques in courts and palaces. But simple eclogues or dramatic novels, like the famous *Celestina* (c. 1490), gave way to true dramas under the Italianate influence. Early in the 16th century Torres Naharro popularized the regular Spanish comedy, first in Naples and then in Spain. The new amusement suited the people, and writing for the stage in verse became the fashion. Lope de Rueda (d. c. 1566) brought wit and culture to the task, and the audiences grew wider and better. Then came Cervantes (1547-1616), the prodigious Lope de Vega (1562-1635) with his plays numbering nearly two thousand, Tirso de Molina (1571-1648), Calderon (1600-81), Quevedo (1580-1645), and their crowd of followers. At the same time Diego de Mendoza, the great Italianate, or another, produced in 1554 the first picaresque novel

or tale of roguery. It consisted of a string of episodes connected with a humble person, offering a fit vehicle for the pungent wit that Spaniards love, and the dramatic presentation of many events. It was called *Lazarillo de Tormes*, and its keen satire, ready fun, and clear, nervous style hit the public taste. From it the novel of peripatetic adventure was born; and through *Guzman de Alfarache*, *Don Quixote*, *El Diablo Cojuelo*, *El Gran Tacaño* (by Quevedo), and *Gil Blas* the descent is clear to *Robinson Crusoe*, *Tom Jones*, and *Pickwick*. But the over-fertility of Spanish literature killed it. By the middle of the 17th century each writer sought to attract attention by eccentricity and preciosity. Gongora, a poet of real power (1561-1627), first showed the way. Moratin (1737-80) kept alive some good traditions of the Spanish stage; but with the exception of a few didactic writers, drawing their ideas from France, the whole of the 18th century and the first thirty years of the 19th century were a blank for Spanish letters. The revival in the middle of the 19th century showed two distinct currents. Those writers who had lived through their exile in England—Saavedra (Duke of Rivas), Trueba, Valera, Espronceda the poet, and others—came home to Spain filled with Scott and Byron, whilst others who had fled to France were enamoured of the romantic picturesque school of French novelists. But soon a more national note was struck, and, curiously enough, by three writers of German descent—Fernan Caballero (pseudonym of Cecilia Faber) the novelist, Hartzenbusch the dramatist and critic, and Adolfo Becquer, who gave a fresh natural and Spanish tone to all they wrote. Then followed a school of truly Spanish authors, who, unfortunately, were often politicians as well. Zorrilla (1817-93) wrote novels on purely Spanish themes, many of which will live; Lopez de Ayala (1829-79); Pedro Alarcon (1833-91), with his charming *Sombrero de Tres Picos*; Juan Valera (1824-1905), whose novels, *Comendador Mendoza* and *Pepita Jimenez*, are worthy of the best Spanish traditions; the prolific novelist Perez Galdos (b. 1845), with his long series of episodic historical novels of the 19th century; and Echegaray the dramatist, whose gloomy works are known throughout Europe. As scientific men of letters Spain may boast of Pascual de Gayangos and Juan Riaño, Marcelino Menéndez Pelayo, who as a bibliophile has few superiors in Europe, and Father Fita, whose historical researches have made

him famous. See Ticknor's *History of Spanish Literature* (1849); Baist's *Die spanische Litteratur in Gröber's Grundriss der romanischen Philologie* (1894-7); Fitzmaurice-Kelly's *A History of Spanish Literature* (1898); and Lemcke's *Handbuch der spanischen Literatur* (1856).

Spalato, or ASPALATHOS (anc. *Salona*), tn., Dalmatia, Austria, on a peninsula, 40 m. S.E. of Sebenico. The town has the largest shipping trade of Dalmatia, notably in wine. Here are the palace of Diocletian, and a cathedral dating from 650. Pop. (1900) 27,198.

Spalding, mrkt. tn., Lincolnshire, England, 14 m. S. by W. of Boston, on Welland. The church of SS. Mary and Nicholas, partly 13th century, was formerly connected with a Benedictine priory (11th century), some 15th-century remains of which still stand. The ruins of Wykeham 'abbey' (1300) are three miles from the town. Ayscoughfee Hall dates from 1420. There are embankments here said to be of Roman origin. Industries include bulb-growing and market-gardening. Pop. (1901) 9,385.

Spalding, JOHN (fl. 1650), Scottish historian, was born probably in Aberdeen, and was for many years clerk to the consistorial court of the diocese. He was a fervent loyalist and Episcopalian; but his *History of the Troubles and Memorable Transactions in Scotland* between 1624 and 1645 is fairly impartial. It was first published in 1792, and later (1829) for the Bannantyne Club; and in 1880 for the Spalding Club, founded to commemorate his name (1839). The new Spalding Club was founded in 1886.

Spallanzani, LAZZARO (1729-99), Italian physiologist, was born at Scandiano (Modena); taught logic and Greek at Reggio (1754), but deserted Homer for science, though he still taught Greek at Modena (1760). He combated the theory of spontaneous generation advanced by Buffon and Needham (1767), and went to Pavia (1768) to teach natural science. In his *Opuscoli di Fisica Animale e Vegetabile* (1777-80) he demonstrated the theory of digestion by solution, not trituration. He wrote also on reproduction and the heart's action (1768); the circulation of the blood, of which he had the first notions (1777); respiration; and animal nature of infusoria.

Span, half a cubit, a natural body measure like the palm, finger, or foot—from the tip of the thumb to the little finger, reckoned in England as nine inches.

Spandau, fort. tn., Prussia, 8 m. by rail N.W. of Berlin, at the influx of the Spree into the

Havel. Here is the Julius tower, containing, since 1874, the sum of six million pounds in coin for the purpose of immediate use in case of war, the money being part of the war indemnity paid by France after the Franco-German war. Pop. (1900) 65,030.

Spanheim, EZECHIEL (1629-1710), German statesman and numismatist, born at Geneva; was professor of rhetoric at Leyden (1651); represented the Palatinate and Brandenburg in England (1665); was ambassador at Paris (1680-9); and helped to negotiate

some naturalists have divided the canine race—viz. (1) wolf dogs, (2) spaniels, (3) greyhounds, (4) hounds, (5) mastiffs, and (6) terriers. The varieties consist of field spaniels, divided into two groups known as springer (the larger) and cocker (the smaller type); water spaniels; and toy spaniels, both British and foreign. The spaniel characteristics are large pendulous ears, long silky hair, curled or shaggy, an acute scent, great intelligence, and a wonderful affection for man.

(1.) The field spaniel (black), a

met with. This spaniel must be active, with plenty of life, and any resemblance in shape, action, or movement to the basset-hound or dachshund should be discarded.

(2.) The Clumber spaniel, so called from the breed having originated at Clumber in Nottinghamshire, a seat of the Duke of Newcastle. This variety works mute, and is wonderfully intelligent. For covert shooting it is the most popular of all spaniels, and can be trained to hunt in packs and take the place of beaters. Points:—A large, low, heavy, massive dog, weighing from 40 to 45 lbs., and scaling about 20 in., with immense bone; head large; forehead largely developed; brows heavy; eyes deeply set; muzzle well developed and very square; fair quantity of lip; ears small for a spaniel compared to the size of the dog, shaped somewhat like a vine leaf, and hanging close to the face; colour true lemon, the paler the better—orange is objectionable; coat soft, shiny, silky, and nearly straight; stern (generally docked) carried low and tufted near extremity.

(3.) The Norfolk spaniel is very like the Clumber, but is shorter in body. It is distinguished by its colour, which is black, liver, and yellow, more or less mixed with white. The Kennel Club does not recognize this type, but the Spaniel Club gives it a separate place in its classification.

(4.) The Sussex spaniel is smaller than the Clumber, and weighs from 35 to 40 lbs. It is perhaps the oldest variety of the breed. It is now rare, its place having been taken by the Clumber. Points:—Head large and not too narrow, well balanced and proportioned in strength, so as not to be chumpy; eyes a dark hazel colour; ears lobe-shaped; body long and deep, with good loin; stern placed and carried low; legs straight and powerful, with good bone; coat abundant, and of a golden liver colour, without white, and not quite so long as the ordinary field spaniel; feathered plentifully.

(5.) The cocker spaniel is a much smaller dog than the varieties previously noticed, scaling from 18 to 25 lbs. It hunts nearly mute, but whimpers slightly on a scent, and, when well broken, distinguishes each kind of game by the note given out. Its proper quarry is the woodcock. Points:—Head long and narrow; muzzle well developed and not snipy; eyes dark and rather large, without being full or prominent; ears long and small near the head, set low and lobe-shaped; body large, deep, and round throughout, and in length just one rib shorter than that of the field



Breeds of Spaniels.

1. Field spaniel (black). 2. Irish water spaniel. 3. Cocker. 4. King Charles. 5. Japanese spaniel. 6. Clumber.

the treaty of Ryswick (1697). He wrote *Dissertationes de Usu et Præstantia Numismatum antiquorum* (1706-16) and *Orbis Romanus* (1704).

Spanheim, FRIEDRICH (1632-1701), Calvinistic theologian, brother of the above, was born at Geneva, and became professor of theology at Heidelberg (1656) and Leyden (1670); defended Calvinism against Descartes and Cocceius, and wrote *Summa Historiæ ecclesiasticæ* (1689). His *Opera* appeared in 3 vols. (1701-3).

Spaniels comprise one of the six generic groups into which

dog to which very great attention has been paid by breeders and fanciers, who have lengthened its body and shortened its legs at the expense of symmetry. Points:—Head long and lean, with good length of muzzle, which must not be snipy; eyes dark; ears set very low, narrow where they leave the head, long and lobe-shaped; body large, deep, long, and low; tail carried below the level of the back; legs straight, strong, short, and large in bone; colour—black is correct, but black and tan, liver and tan, liver and white, and pied specimens are

spaniel; stern carried and set low; legs powerful and straight; coat flat and abundant, but not too long, with plenty of feather; colour, any colour more or less marked with white.

(6.) The water spaniel. There are two varieties—the English and the Irish; but the former is seldom seen, and its purity of strain is doubtful. The Irish water spaniel is admirable as a retriever. Its height is about 22 in., and weight 40 lbs. Points:—Head capacious; forehead high; the face is clothed with short hair, over which hangs a top-knot of considerable length, coming forward to a peak—these two points are indicative of true breeding; ears very long, measuring two feet from tip to tip when extended; body moderately long and very strong, covered with short, crisp curls, except the face, tail, and a small patch on the inside of the hind legs, which remain smooth; tail thick at base and tapering to a point, and without feather; eyes brown and full of intelligence; colour a pure deep puce, without white. The top-knot and forelock are not fully developed until the age of three years.

(7.) Toys spaniels have for many years been drawing-room dogs. There are four varieties, distinguishable by colour only. The King Charles is black and tan; the Prince Charles, black, tan, and white; the ruby, rich red; and the Blenheim, orange and white, with a blaze on its forehead, in the centre of which an orange star must appear. The toy spaniel was brought into favour by the Stewarts. The modern toy spaniel scales between 4 and 10 lbs. Points:—Head apple-headed, well domed, and with very prominent eyes, bold and set wide apart, with enormous pupils; nose laid back close to the eyes; muzzle square and blunt; lower jaw turned up, so as to hide the teeth; ears very long; body cobby, with an abundant, fine, silky coat; ears fringed with hair, the same shade as the darker colouring of the body; tail carried low, and should be docked to about three inches. The colours in all should be brilliant; dull colour is a great defect.

(8.) Foreign toy spaniels. There are two varieties—the Pekingese and the Japanese; but both are probably the same breed. They were first imported into England towards the close of the 19th century, and fabulous sums were paid for fancy specimens. The Japanese spaniel, sometimes called the 'sleeve dog,' is black and white or lemon and white in colour; coat massive and very silky; tail tightly curled over its back, with flowing plume; very

diminutive, some specimens weighing under 4 lbs.; face short; ears small, but well feathered; forehead and eyes not prominent, as in the English toy spaniels; countenance bears a singular resemblance to the Mongolian cast of features.

Spanish-American War, THE. War broke out between Spain and America on April 21, 1898. The revolt of the Cubans against Spanish misrule aroused the keen sympathy of the American people. On Feb. 15, 1898, the *Maine*, an American battleship, lying in Havana harbour, was blown up, and two hundred and fifty officers and men were killed. The Americans attributed the explosion to Spanish treachery, and a cry for vengeance went up from the States. Congress demanded the withdrawal of Spain from Cuba, and authorized the use of the naval and military forces to enforce the demand. Before this ultimatum could be presented, however, the American minister at Madrid was handed his passports, and war was begun. Admiral Sampson was ordered to blockade Havana, where General Blanco had an army of 100,000 men. General Shafter, at the head of the regular army of 30,000 men and a strong force of volunteers mobilized at Tampa, prepared for the invasion of Cuba. Meanwhile Admiral Cervera, with a powerful squadron of modern ships of war, set sail from Cape Verde for Cuba by order of the Spanish government.

When war broke out Admiral Dewey was at Hong-kong. Before day broke on Sunday, May 1, with his flagship *Olympia* and five cruisers he entered Manila Bay in the Philippine Is., and steamed up to Cavité, where lay a Spanish fleet under Admiral Montojo. The engagement lasted only four hours. The Spaniards ran their vessels ashore, and soon all that remained was a few battered and burning hulks. Cavité surrendered, and Manila was at the mercy of Admiral Dewey, who, however, had no troops to land. The Philippine nationalists, led by Aguinaldo, laid siege to the capital, until the arrival of American troops in the beginning of July enabled Admiral Dewey to take decisive steps. It was not, however, till August 13 that Manila was taken possession of.

Meanwhile Admiral Cervera had made his way to Santiago. The American admiral at once established a strict blockade; and the more effectively to bottle up the enemy, Lieutenant R. P. Hobson and seven men on June 3rd sank a steam collier in the opening of Santiago harbour, but the vessel drifted too far into the harbour to prevent Cervera's exit.

When General Shafter's forces were ready for invasion, an army of 16,000 men began to disembark at Daiquiri on the 22nd June. The Spaniards offered little resistance. General Shafter immediately advanced on the town, which was garrisoned by some 30,000 men. On the 3rd July Admiral Cervera made a sudden dash for liberty. A couple of torpedo destroyers were soon driven ashore and rendered helpless. Five armoured cruisers were likewise, one by one, disabled and driven ashore. Admiral Cervera himself surrendered after running his flagship ashore to save her from sinking. This was followed on the 17th by the surrender of Santiago. Then Spain sued for peace, and hostilities ceased on the 12th of August. Spain assented to the evacuation of Cuba, the cession to the United States of Porto Rico and other West Indian possessions, and the occupation of Manila by the United States till the conclusion of a treaty of peace. The Americans declined to take responsibility for the Cuban debt, and insisted on the annexation of Porto Rico and of the Philippines, for which, by way of indemnity, they agreed to pay five millions sterling to the Spanish government.

Spanish Fly. See CANTHARIDES.

Spanish Legion. See EVANS, GEORGE DE LACY.

Spanish Main, name applied indiscriminately to the Caribbean Sea, and to the Spanish possessions on the coasts of Central and S. America washed by it.

Spanish Reformed Church, originated in Mexico, after the establishment of the Mexican republic, from a Protestant mission introduced by Miss Rankin in 1866. The converts approached the American Episcopal Church, and Dr. H. C. Riley was consecrated first bishop of the Mexican Reformed Church. Since then two other bishops have been consecrated. The movement then spread to Spain. Lord Plunket, bishop of Meath, and afterwards archbishop of Dublin, appealed in its behalf in 1881. There are reformed congregations at Seville and Malaga. The reforming movement has also reached Portugal. A liturgy has been drawn up from the English Book of Common Prayer and from ancient Mozarabic sources.

Spanish Town, tn., Jamaica, W. Indies, 12 m. w. of Kingston; was formerly the capital of the island. Pop. about 6,000.

Spar, a term popularly applied to crystallized minerals, and in some instances adopted by the mineralogist to designate some

of the most abundant species, such as calc-spar, fluor-spar.

Sparaxis, a genus of South African bulbous plants, belonging to the order Iridaceæ. They bear large flowers, mostly yellow, and are often cultivated as greenhouse plants.

Spark Discharge. See ELECTRO-MAGNETIC WAVES.

Sparks, JARED (1789–1866), American historian, born at Willington, Connecticut. From 1819 to 1823 he was a Unitarian minister in Baltimore. He became one of the conductors of the *North American Review*, of which he was sole proprietor and editor in 1823–30. He became chaplain to the House of Representatives (1821), professor of history at Harvard (1839–49), and president of Harvard (1849–52). His chief work was his edition of *The Writings of George Washington*, with a *Life* (12 vols. 1834–7). He also published *The Diplomatic Correspondence of the American Revolution* (1829–30), and *The Works of Franklin*, with a *Life* (10 vols. 1836–40). He wrote a *Life of Gouverneur Morris* (3 vols. 1832). See Ellis's *Memoirs of Jared Sparks* (1869).

Sparling, or SPERLING, the Scottish name for the smelt.

Sparrow (*Passer*), a genus of finches, which includes *P. domesticus*, the house sparrow. The members of the genus are widely distributed over the Old World, and may be recognized by the short, stout bill and the short wings. The diet of the house sparrow is very varied; the bird feeds its young upon insect larvæ. But the adults are excessively destructive both in gardens and to the crops of the farmer. In plumage there is a distinct difference between the sexes, and some variation in colour according to the season. The adult male may be recognized by the black throat. Partial albinos are not at all infrequent. The nest is very roughly constructed, and is usually of straw or grass; but the birds are also partial to rags, especially if these are brightly coloured. There is always a thick lining of feathers. Several broods are reared in a season. There are from five to six eggs in a clutch, these being bluish white, speckled or blotched with brown and black. The common sparrow is found throughout Europe, and extends into Siberia, while it is represented in the southern parts of Asia by a species or variety known as *P. indicus*. The common form also extends into Africa. In Europe generally, and in Asia, there occurs also the smaller tree-sparrow (*P. montanus*), in which the two sexes are alike; but in Britain it is considerably rarer than the common form.

Other species of the genus occur throughout the Old World.

The hedge-sparrow or accentor (*Accentor modularis*) of Britain is a member of the thrush family. It has a sweet song, and can be readily distinguished from a true sparrow by the bill, which has not the short, stout shape characteristic of the finches, but is broad at the base and conical. The white-throated sparrow of the United States is a bunting (*Zonotrichia albicollis*).

Sparrow-hawk (*Accipiter nisus*), a bold and rapacious British hawk, which inhabits wooded districts. It is very variable in size and colour, but is about thirteen inches long in the male, the female exceeding this measurement by nearly two and a half inches. In the adult male the plumage of the upper parts is dark bluish gray, except for a white spot on the nape of the neck; the under surface, cheeks, and chin are rufous, barred with brown; the tail has from three to five dark bands. Like the other sparrow-hawks, the common species has the third toe greatly elongated, while the wings are short. The common



Sparrow-hawk.

form is distributed over the whole of Europe and northern Asia, and in winter extends into India, China, and northern Africa. It feeds upon the smaller mammals and on birds, and does great damage in game preserves. The bird usually builds its own nest, which is placed in a tree. In Europe the sparrow-hawk was formerly employed extensively in hawking, and the sport is still pursued in Hungary. In India and in Japan it is also prized by falconers, but in India the smaller besra hawk (*A. virgatus*) is also employed. There are in all about twenty species of sparrow-hawk.

Sparta, the chief city of Laconia, in the Peloponnese of Greece. It was also called Lacedæmon, which was the original name of the country. Sparta stood on the right bank of the Eurotas, on some low hills running down from Mt. Taygetus. It was, in fact, an aggregation of five villages. In the Mycænean

age Amyclæ was the chief town in the district. In Homer, Menelaus is king of Sparta; this fact implies that Achæan conquerors superseded the native rulers. Soon after the Trojan war, probably about 1100 B.C., the Dorian invasion took place, and it was in Sparta that the Dorian character and institutions were displayed to the fullest extent. The most obvious explanation of the double kingship at Sparta is that one royal house was Dorian, the other Achæan or pre-Achæan, though later legends traced both dynasties back to Heracles. Besides the Spartiata, or Spartan citizens proper, there were two other classes in the state—the Helots and the Perioeci. The former were the descendants of the conquered population; the latter either Dorians dwelling in other communities than Sparta itself, or non-Dorians who had made terms with the invaders without being conquered. They had no political rights in the state, though they were free, and managed their own local affairs; they also served in the Spartan armies. The Helots were serfs of the people, not of individuals, and were attached to the soil; they cultivated the land of Spartan owners, paying them a certain proportion of the produce. They served in the army as light troops, attendants of the Spartans, and sometimes as regular infantry. But they were always regarded with suspicion by the Spartan government, as they were more numerous than the citizens; a secret police was kept up to watch them, and to remove persons of dangerous ability. About 424 B.C. the government issued a proclamation asking all Helots who claimed to have done good service in the war to give in their names. About two thousand did so, and were crowned and treated with honour, and shortly afterwards all were done to death in secrecy. Again, in 403 a rising of the Helots was with difficulty put down. The establishment of the Spartan constitution was attributed to Lycurgus, but modern critics regard his existence as legendary. In any case the constitution was the result of a compromise. The two kings were perpetual commanders-in-chief of the army; they had the right of making war as they chose, but were accompanied by two ephors on their campaigns, and were responsible to the people for their conduct. They also held certain priesthoods and judicial functions, possessed royal domains and a variety of personal privileges. The oligarchic element in the state was the council of elders, consisting of twenty-eight men over sixty years of age, with the

two kings. They were chosen by acclamation in the assembly. This, the democratic element in the state, consisted of all free citizens over thirty years of age. The ephors, the most characteristic and powerful element in the state, were elected by the people, and were five in number. They could indict and judge the kings, and were the supreme civil court at Sparta; the council of elders was the supreme criminal court. The ephors were also responsible for the maintenance of order and discipline. This discipline was practically a perpetual military training. No deformed child was reared; from the age of seven every boy was taken away from his mother's side and trained to war and hardship. He wore the same scanty clothing summer and winter, slept on the bare ground, and was exercised in hunting, gymnastics, and the use of weapons. At twenty the youths joined the army, and were enrolled in the military messes or *syssitia*. Even when allowed to marry, a Spartan could only live with his wife by stealth. The Spartan women, too, were trained to gymnastics; they were renowned for their beauty and their heroism, and also for their influence over the men. Wealth in Sparta consisted chiefly in land. The use and possession of money was forbidden; instead of coin, bars of iron were used until 320 B.C., though long previous to that silver coin was in circulation. Such a state of society prevented any growth of literature or art; though in the 8th and 7th centuries B.C., before the system was crystallized into its later rigidity, Spartan poets and musicians were famous, and the names of Spartan artists are known. But after 600 B.C. Sparta's one trade was war; all alien influences were discouraged, and the wit of Sparta found its only expression in the many 'laconic' sayings quoted by ancient writers.

Sparta, in two great wars dated traditionally about 725 and 625 B.C., conquered Messenia, expelled its kings, and made the Messenians Helots. In the 6th century she overpowered Argos, though without destroying that city's independence, and became the head of a league which included nearly all the states in the Peloponnese, and many, such as Athens, outside. Accordingly, Sparta headed Greece against the Persian invasions (480 B.C.); but her conduct subsequently disgusted many Greeks, and the Athenian confederacy was established as a rival to that of Sparta. The Peloponnesian war (431-404 B.C.) restored the supremacy in Greece to Sparta; again her domineering treatment of her

allies caused her to lose her power, and in 371 the Theban victory at Leuctra reduced her to a secondary position in Greece. In 369 B.C. the Thebans restored liberty to Messenia. Sparta was captured by the Macedonians in 221 B.C. It then joined the Achæan League, was ruled by the tyrants Nabis and others, and in 146 was conquered by Rome. But the Spartans retained their ancient customs and training for some centuries after the Christian era.

The new town of Sparta, which was founded in 1834 after the

against him, finally having 100,000 men under his command, and holding all Lucania and Brutium. He was at last defeated and slain by Crassus in 71 B.C.

Spartanburg, city, S. Carolina, U.S.A., co. seat of Spartanburg co., 83 m. N.W. of Columbia. Here is Wofford College. Pop. (1900) 11,395.

Spartiate, a first-class British cruiser (11,000 tons), launched in 1898. This name came into the navy with a French 74-gun ship captured at the Nile (1798).

Spasm, a violent and invol-



Ancient Sparta.

restoration of Greek independence, is a regularly built place, with broad streets and gardens, and a population of 4,000.

Spartacus, Roman gladiator, was by birth a Thracian. After being by turns a shepherd, a soldier, and a brigand chief, he was taken prisoner by the Romans, and sold to a trainer of gladiators. In 73 B.C. he and two Gaulish fellow-prisoners broke loose with about seventy comrades, and took refuge in the crater of Vesuvius. Spartacus then proclaimed freedom to slaves; and for two years he defeated all the armies sent

untary contraction of a muscle, of a group of muscles, or of a muscular organ. The contraction may be either continuous—i.e. 'tonic'—or contraction and relaxation alternating in quick, jerky succession may produce the form of spasm known as 'clonic.' Cramp is tonic in character, while convulsions are typical of clonic contraction. Spasm is essentially a nervous disorder, and has its centre in the medulla oblongata. This centre is stimulated by the sudden interruption of the normal gaseous interchange between the blood and the tissues;

also by the rapid destruction of the medulla. It is further acted upon by certain drugs; many poisons, both inorganic and organic, produce spasms and convulsions before death. Injury and electrical stimulation of the motor areas of the cortex cerebri have both been followed not only

writer's cramp, tetany, chorea, tarantism, hydrophobia, tetanus, paralysis agitans, epilepsy, strychnine poisoning, and many forms of hysteria. To these may be added asthma, hay fever, Raynaud's disease, laryngismus stridulus, whooping cough, renal, biliary, and intestinal colic, ves-

ulation are essential. Since mechanical irritants so often produce spasmodic disorders reflexly, surgical operations of considerable magnitude may sometimes be required for the relief of spasm.

Spasmodic School of English 19th-century literature consisted of a group of authors whose works, at first popular, fell into neglect owing to their overstrained and unnatural style of expression, well burlesqued by Professor Aytoun in *Firmilian* (1854). Chief amongst these were Alexander Smith (1830-67) and Sydney Thompson Dobell (1824-74). To these must be added Philip Bailey (1816-1902) and George Gilfillan (1813-78).

Spathe, in botany, a large bract which occurs on the peduncle below an inflorescence. A fleshy spike of flowers covered by a spathe is termed a spadix. In palms the spathe usually takes the form of a broad blade.

Spathic Iron Ore. See **SIDERITE**.

Spatra. See **MILLINERY**.

Spavin. See **HORSE—Organs of Locomotion**.

S.P.C.A., Society for the Prevention of Cruelty to Animals.

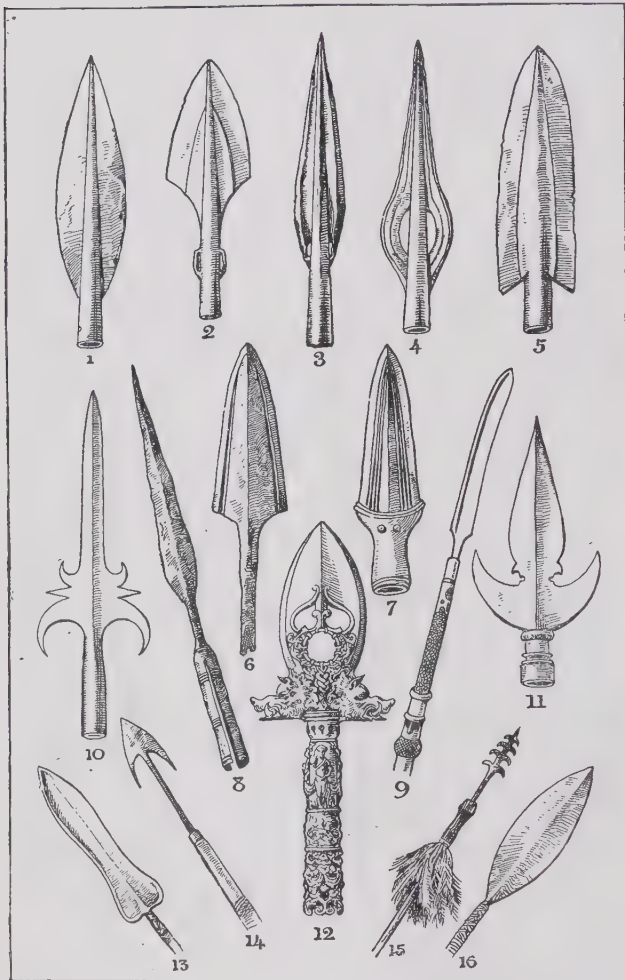
S.P.C.C., Society for the Prevention of Cruelty to Children.

S.P.C.K., Society for Promoting Christian Knowledge.

Speaker. See **PARLIAMENT**.

Speaker, THE, was founded in 1890 as a weekly review devoted to the Gladstonian interest in place of the *Spectator*, which broke with Gladstone on the Home Rule question. Its first editor was Sir T. Wemyss Reid; but it was on the literary rather than the political side that the *Speaker* was most notable. Its 'Literary Causeries,' written by A. T. Quiller-Couch, Augustine Birrell, J. M. Barrie, and others, were a conspicuous feature of the week, and some of 'Q's' (Quiller-Couch) best short stories first appeared in this paper. George Moore wrote on art, and 'A. B. W.'—Mr. Walkley of the *Times*—was the dramatic critic. In 1899 the *Speaker* changed hands, and Sir Wemyss Reid was succeeded in the editorial chair by Mr. John Lawrence Hammond, who made the *Speaker* the mouthpiece of the 'Young Oxford Liberalism,' which was strongly opposed to the policy of the South African war.

Speaking-trumpet, an instrument for artificially magnifying the sound of the human voice, formerly much used at sea, but now somewhat superseded by the use of semaphore, steam, and other methods of signalling, though still of great service in giving orders in a storm. In the United States navy it is the recognized badge of the officer



Various Forms of Spears.

1-5. Prehistoric Irish (bronze), as numbered in text. 6, 7. Prehistoric British. 8. Anglo-Saxon (iron). 9. Japanese. 10, 11. Medieval types. 12. German boar spear (16th century). 13, 14. West African. 15. Philippine. 16. Bantu.

by localized but by general convulsions. Uremia frequently produces general convulsions.

A very large group of neuroses, or functional disorders of the nervous system, are classified as spasmodic. Spasm is the chief symptom in cramp, histrionic spasm, spasmodic wry-neck,

ical and rectal spasm, and those cases of angina pectoris that are due to spasmodic contraction of the coronary arteries of the heart. As a rule, rest and warmth are indicated, with local and general nerve sedatives, although in a large number of spasmodic affections counter-irritation and stim-

of the deck. The invention, ascribed to Sir Samuel Morland (1670), has been also assigned to Athanasius Kircher.

Spear, a pointed weapon with a long shaft, used for thrusting. Spear-heads, from extremely remote periods, seem to have been made of bronze: 'a pole fitted with bronze' is one of the brief Homeric definitions. Reeds as well as the stems of young ash trees were used for the shafts. Lances and javelins of various forms were included in the Greek word for spear. The equivalent weapons used by the Romans were heavier and stronger. Some forms of spearlike missiles were, like the Saguntine *falarica*, propelled by mechanical devices, such as twisted ropes; some of them were barbed. The Bronze age spear-heads of Great Britain, made of cast bronze, are notable examples of finished workmanship and elegance of form. They vary in length from lance-heads 2½ inches long to specimens like the Denhead, Coupur-Angus, spear-head, which is 19 inches long, and has segmental and circular openings in the blade. They are particularly numerous in Ireland, and are there arranged in five groups, thus: (1) the simple leaf-shaped; (2) the looped, with 'eyes' on each side of the socket below and on the same plane as the blade; (3) those with loops in the angles between the edge of the blade and the socket; (4) those with side perforations through the blade; and (5) those in which the base of each side of the blade projects or becomes barbed. These spear-heads are fixed, through their sockets, by rivets to the shaft, and the blades sometimes show lines and dots of ornamentation.

It is difficult to assign closely the period of their occurrence throughout the British area, as they have never been found in direct association with interments. There are iron specimens, presumably of the 5th and 6th centuries, known on the Continent. By the close of the 14th century the forms had developed into an extraordinary variety, and, owing to the increased trade with the East, the shape, length, and decoration of the shaft underwent considerable modifications and changes. In the Admiralty Is. (Pacific) spear-heads are made of black obsidian, chipped in the manner of flint-flaking, and attached in an ingenious way to the head of the shaft by means of gummed threads. The natives of Queensland, Australia, use a very long slender-shafted spear, the point of which may be set in a reed, and is often barbed and poisoned. This lance is thrown

by using a strong piece of wood deeply notched at one end, called a spear-thrower. In Scotland there was formerly in use a pronged spear called a leister, for spearing salmon. See Evans's *Ancient Bronze Implements of Great Britain* (1881).

Spearmint (*Mentha viridis*), a hardy British plant frequenting marshy places. It has creeping roots, and bears sessile, lanceolate leaves, which are acute, glabrous, and unequally serrated. The whole plant has a pleasant aromatic odour, and its leaves are used as a flavouring agent in cookery. See MINT.

Spearwort, a name given to certain species of the genus *Ranunculus* on account of their narrow, tapering leaves. *R. lingua*, the great spearwort, and *R. flammula* the lesser spearwort, are British waterside plants.

Special Bastard. In England a child born before marriage of parents who afterwards marry is not, as in Scotland, legitimized by the subsequent marriage, and is called a special bastard.

Special Case. When the parties to an action are agreed as to the facts, so that there are only questions of law to be determined, they may state the facts in the form of a special case for the decision of the judge. This procedure saves the expense of calling witnesses.

Special Constable. See CONSTABLE.

Special Jury. See JURY.

Special Licence, a licence to marry without banns, and at any time or place, granted by the archbishop of Canterbury, on special grounds, and as a matter of discretion. It costs £29, 8s.

Special Pleader is generally a student of the Inns of Courts, who, though qualified, is not called to the bar. Under the Stamp Act, 1891, he takes out an annual £9 certificate, and he engages in chamber practice, drawing pleadings, and so forth. But the simplification of pleadings introduced by the Judicature Acts has practically abolished his work.

Special Sessions. See SESSIONS OF THE PEACE.

Specialty Debt, in English law, a debt secured by deed—i.e. by writing under seal—as distinguished from a simple contract debt, or from a debt of record, such as a judgment or recognizance. Actions to recover specialty debts may be brought at any time within twenty years, whereas in the case of simple contract debts the period of limitation is six years.

Species, one of the grades in biological classification—a group of individuals, fertile *inter se*, and resembling one another in certain

distinctive hereditary characters which mark them off from other groups. Three criteria of well-established species are:—(1.) The distinctive specific characters which the members share should show some degree of constancy from generation to generation, and they should not be similarities directly acquired in each individual lifetime through the influence of similar conditions of life. (2.) The distinctions between one species and another should always be of greater magnitude than the distinctive features which may characterize the members of a family (using the word family here to mean the progeny of a pair). (3.) The members of a species are normally fertile *inter se*, but not usually, or not readily, with members of other species. In fact, the evolution of distinct species has in part depended on a restriction of the range of fertile intercrossing. A species often means, however, nothing more than a group of individuals whose common and distinctive features seem to naturalists important enough to warrant the use of a special name. It should be clearly understood that a species is a relative conception—a device for scientific convenience when we wish to include under one title all the members of a group of individuals who resemble one another in certain distinctive hereditary characters. But as resemblances which seem important to one naturalist may seem trivial to others, there are often wide differences of opinion as to how many species should be recognized in any particular case. Thus Haeckel says of calcareous sponges that, as the naturalist likes to look at the problem, there are 3 species, or 21, or 289, or 591!

When we study a large number of more or less similar organisms, we find that they can be arranged in groups. In each group there is, so to speak, a densely-packed centre of closely similar individuals, and a more sparsely peopled periphery of more divergent forms. This big fact of observation may be expressed with precision by measuring particular characters throughout a large number of similar individuals, and plotting out a curve, known as the curve of frequency. It will then be seen that the great majority of the individuals measured occupy an area near the top of the curve, and that there are only a few at the two basal ends. Whether we call one of these groups a variety, a subspecies, a species, or a genus, matters little. These groups represent stages in an evolutionary process: they are never quite constant, and often fade into one another, being

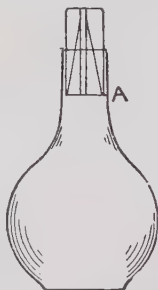
linked by the divergent outliers or variants of each group.

It remains to give an illustration of the different grades of classification. All the tigers are said to form the species *Felis tigris*, of the genus *Felis*, in the family *Felidæ*, in the order *Carnivora*, within the class *Mammalia*, in the series or phylum *Vertebrata*. The resemblances of all tigers are very close; well marked, though not so close, are the resemblances between tigers, lions, leopards, jaguars, pumas, cats, etc., which form the genus *Felis*; broader still are the resemblances between all members of the cat family *Felidæ*, which includes, besides the genus *Felis*, the cheetah (*Cynalurus*), the extinct 'sabre-toothed tiger' (*Machærodus*), etc.; still wider the likenesses between all the cats, dogs, bears, and seals which form the order *Carnivora*; even more general are the affinities of structure which bind mammals together in contrast to birds or reptiles; and, finally, there are the common characters of all vertebrate or chordate animals. A list of about a score of definitions of 'species' will be found in Quatrefages's *Darwin et ses Précurseurs Français* (1870). Romanes in his *Darwin and after Darwin* (vol. ii. 1895) reduced the number of logically possible definitions to five.

Specification. See PATENTS. **Specific Gravity**, or **RELATIVE DENSITY**, is the comparison of the heaviness of a substance with that of a standard substance, and may thus be defined as the number of times the weight of a certain volume of the substance contains the weight of the same volume of the standard. In the case of solids and liquids, water at the point of its maximum density—i.e. at 4° C.—is usually taken as the standard; while in the case of gases, air, or better, hydrogen, measured under the same conditions of temperature and pressure as the gas in question, is employed. As the result in either case is a ratio, the specific gravity is independent of the actual volume, weights or system of weights and measures used, and is numerically equal to the absolute density, or weight of unit volume, if the unit of volume of the standard substance is of unit weight, as in the metric system is the case with water.

Methods of Determination.—For solids and liquids two general principles are relied on to determine specific gravities—viz.: (1) by weighing measured volumes; (2) by measuring buoyancy. In the case of liquids the measurement of their hydrostatic pressure can also be utilized. The methods employed for gases are

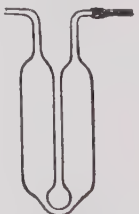
in general similar in principle, and are described in the article on gas and vapour density. In the weighing method a suitable vessel to contain a measured quantity of the substance is weighed, filled to the mark with the substance, if a liquid, and weighed again. The process is then repeated with water, and the weight of the substance is divided by the weight of the equal volume of the water. Due regard has to be taken of the temperature, the substance being



Specific Gravity Bottle.

A, Mark to which stopper is pushed down.

either measured at the required temperature or the volume corrected by calculation from the co-efficient of expansion. In using this method for solids, the difficulty that they cannot be made to fit exactly into the vessel is got over by filling up the interstices with water, the weight of which is subtracted from the weight of water filling the whole vessel in order to get the weight of water equal in volume to the substance. The vessels used in the above methods are called pycnometers or specific gravity bottles, and consist essentially



Sprengel's Pycnometer.

of a bottle with a very narrow neck or perforated stopper, so that the bottle can be filled exactly with the same quantity of liquid each time. The difficulty of filling is got over by the plan suggested by Sprengel of using a U-tube with very narrow tubes sealed to each limb into which the liquid can be readily sucked; the modified forms invented by Perkin and Nicol are particularly convenient. In the case of solids

a wider aperture must be provided, so that the solid can be inserted in small pieces; this opening is afterwards closed by a stopper, and the bottle or tube filled up with water as described. With solids that are affected by water, liquids such as petroleum or benzene may be used, or the volume may be determined by the volumometer, which also allows for pores in the substance not readily filled by liquids. This instrument consists of an air-tight vessel to enclose the solid, connected by a tube to a mercury reservoir, so that the pressure on the contained gas can be varied. The increase in volume V^1 caused by a given diminution of pressure from P to P^1 is read when the vessel is empty; when in accordance with Boyle's law the volume, V , of air in the vessel is found from the equation,

$$VP = (V^1 + V)P^1, \text{ whence } V = \frac{P^1V^1}{P - P^1}.$$

Repeating with the solid in position, a second and smaller value for V will be found, the difference giving the volume of the solid, so that if its weight is known the specific gravity can be calculated.

The buoyancy methods, which are very varied in detail, depend upon the principle discovered by Archimedes, that a body immersed in a liquid is buoyed up by a force equal to the weight of liquid it displaces. Thus, if an object is weighed first in air, and then, when suspended by a thread, in water, it weighs less the second time by an amount equal to the weight of water equal in volume to itself. This weight, divided as before into the weight of the object, gives the specific gravity. In applying this method to liquids, it is only necessary to find the loss of weight of an object both in the liquid and in water to obtain the necessary weights of equal volumes of the two. Hydrometers, Mohr's specific gravity balance, and the use of 'heavy liquids' also depend on the principle of buoyancy. Hydrometers are of two kinds—viz. of fixed and variable immersion. Nicholson's hydrometer is an example of the first kind, and consists of a hollow brass cylinder with conical ends, provided with a weighted basket at the lower end to make it float upright, and a pan supported on a thin vertical wire at the upper end. The instrument is adjusted by weights on the pan so as always to be immersed to a fixed point on the wire. If the weights required to produce this when immersed in water and in the liquid of which the specific gravity is sought are added to the weight of the instrument, the weights of equal volumes of the liquid and of water are obtained, and hence

the specific gravity. The specific gravity of a solid can also be determined if it is first placed in the upper pan and then in the basket, the hydrometer being adjusted with weights each time; the difference between the weights used with and without the object in the upper pan gives its weight in air, while its weight in water is equal to the difference of weights used when the body is in the pan and in the basket. The specific gravity is then calculated in the same way as before. Mohr's specific gravity balance is on the same principle as the Nicholson hydrometer, a plummet being sunk to the same point by placing rider-form weights on a balanced beam, from which the plummet is hung by a fine wire. It is, however, much more sensitive and easy to work with, as the plummet and weights are made of such sizes as to give specific gravities without calculation.

Specific gravity beads are fixed immersion hydrometers, and consist of small differently weighted bulbs that sink or swim in a liquid according to its density, which is that of the bead that remains in equilibrium, neither sinking nor floating. The same principle is made use of in determining the density of minerals, a heavy liquid being adjusted by admixture with a light one till the fragments of the substance

Hydrometers of variable immersion are usually light hollow glass spindles weighted by shot or mercury. The divisions on them are of unequal size, for as the volumes immersed are inversely as the densities of the liquids, the spaces representing equal increments in density diminish harmonically. Variable immersion hydrometers are made of special forms and sizes to test the specific gravities of particular liquids, such as alcohol, milk, urine. The most important of these instruments is Sikes's hydrometer, which is the standard for finding the strength of aqueous solutions of alcohol for excise purposes. It is made of gilded brass, and is provided with weights (A) that can be placed to the stem to increase the range; the graduations represent '00175 difference in specific gravity, and are convertible into degrees under and over proof by graduated scales.

In using the hydrostatic pressure method of measuring specific gravities, the liquid is poured into one limb of a vertical U-tube and water into the other, care being taken that the less dense liquid is not forced round the bend, and the heights of the balancing columns measured. Then, as the product of the height of the liquid into its specific gravity is equal to the same product in the case of the water column, the specific gravity of the liquid is found by dividing the height of its column into that of the water. With liquids that mix with water the columns are sucked up from different beakers into an inverted U-tube by a branch tube at the bend, so that the liquids are separated by an air space. The same principle is then applied.

In general, substances vary considerably in specific gravity. Thus, ordinary liquids, with the exception of mercury, which has a specific gravity of 13.6, range from about '6 to 3, and homogeneous solids from under 1 to over 22. Figures for the specific gravities of the elements are given under ELEMENTS, and those of other substances under their specific headings. A table of the specific gravities of a few common substances is given below. Full tables have been compiled by F. W. Clarke, and published by the Smithsonian Institution. The practical details of carrying out the various methods may be found in Kohlrausch's *Physical Measurements* (trans. Waller and Proctor, 1873), Ostwald's *Physico-Chemical Measurements* (trans. Walker, 1894), and Glazebrook and Shaw's *Practical Physics* (1893). See also HYDROMETER.

Table of Specific Gravities.

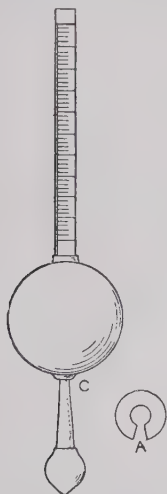
Solids.	
Aluminium	2.7
Brass	8.4-8.7
Clay	1.8-2.6
Coal	1.2-1.7
Copper	8.9
Diamond	3.5
Ebony	1.1-1.2
Gold	19.3
Glass	2.4-3.4
Granite	2.5-2.9
Ice . . . . .	.92
Iron	7.8
Lead	11.3
Marble	2.5-2.8
Oak . . . . .	.85-.95
Pinewood . . . . .	.5
Quartz	2.65
Silver	10.6
Sugar	1.59
Sulphur	1.98-2.07
Tin	7.3
Zinc	7.1

Liquids.	
Alcohol . . . . .	.80
Ammonia solution . . . . .	.88
Benzene . . . . .	.89
Ether . . . . .	.73
Glycerin	1.26
Hydrochloric acid	1.27
Mercury	13.6
Milk	1.03
Nitric acid	1.56
Sea water	1.03
Sulphuric acid	1.85
Turpentine . . . . .	.86-.89

Gases (compared with water).

Air . . . . .	.00129
Ammonia . . . . .	.00077
Carbon dioxide . . . . .	.00198
Chlorine . . . . .	.00316
Hydrogen . . . . .	.00009
Nitrogen . . . . .	.00126

Specific Heat. The quantity of heat required to raise the temperature of a body is proportional to the mass of the body, and nearly proportional to the range of temperature it is to be raised to, but differs widely with the material of which the body is composed. In order to express this difference, it is necessary to formulate a standard unit of heat. The one most commonly used is the quantity of heat that is required to raise the temperature of unit mass of water one degree. In metric units this is called a 'calorie,' and is the heat required to raise the temperature of 1 gram of water 1° C.; in British units the British Thermal Unit (B.T.H.U.) is the heat required to raise 1 lb. of water 1° F. As the quantity of heat required to raise the temperature of a body varies somewhat with the temperature, the unit is usually specified to be measured at 15° C., or else the mean value between 0° and 100° C. is chosen; the two values, however, differ but slightly. Instead of using a water standard, it is perhaps more scientific to express



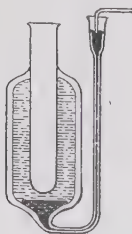
Sikes's Hydrometer.

A. Weight to be slipped on at c.

are just in equilibrium; the specific gravity of the liquid is afterwards found by a hydrometer or otherwise. Suitable heavy liquids are methylene iodide, solutions of thallium and silver nitrates, mercury and potassium iodides.

quantities of heat in the absolute units of mechanical work into which the heat can be converted (see THERMODYNAMICS); but until the exact value of the ratio between the two is more definitely decided, the water standard will probably be retained, especially as in practice most measurements are compared with it.

Methods of Determination.—The method of determining specific heats most frequently used is the 'method of mixtures.' A known weight of the substance, best in small pieces, at a known high temperature is mixed with a known weight of water at a lower temperature, and the temperature of the mixture is taken. Then, as the heat given out by the hot substance in cooling to the temperature of the mixture is equal to that received by the cold water in being warmed up, the product of the specific heat of the substance into its mass and fall of temperature is equal to the product of the mass of the water into its rise of temperature, the specific heat of the water being, by definition, unity. Due allowance must be made for the heat required to warm the vessel (calorimeter) in which the experiment is carried out, and for heat lost to the atmosphere; and the method needs to be further modified, if the substance and water interact, by substituting some other liquid for water. In this case, as in the case of liquids, in which a hot solid, such as iron or copper, is added to the liquid, the specific heat of the substance used instead of water requires to be known; and from the fact that the product of the specific heat into the change of temperature and mass of both substances is the same, the unknown specific heat can be calculated. This process requires considerable quantities



Bunsen's Calorimeter.

of the substance in question in order to get an accurate result—a difficulty avoided in Bunsen's ice calorimeter. Ice calorimeters, which depend on the fact that to melt unit weight of ice requires approximately eighty times as much heat as is required to raise the same weight of water one degree, were invented by Black, but

did not give very good results, owing to the difficulty of measuring the amount of ice melted. This was obviated by Bunsen, who measured the contraction caused by the melting of ice, this being equal to .09 c.c. per gram melted. In Bunsen's instrument a test tube is sealed into and enclosed by an outer tube, the lower part of which, together with a tube leading from it to a narrow gauge, is filled with mercury. Water fills the upper part of the outer tube, and is frozen round the test tube; the whole apparatus is then immersed in snow, to prevent the ice from being melted by outside heat. The substance of weight (w) is then dropped into the test tube, and the volume (v) by which the mercury recedes in the gauge is measured; then the specific heat of the substance can be calculated from the relation $S.H. = \frac{v \times 80}{.09 \times w \times t}$, where t is the fall of temperature of the substance.

The rate at which a substance loses heat by radiation can also be utilized to measure its specific heat by noting the times that heated quantities of it and of water take to cool through a given range under exactly similar circumstances. This method can, however, only be applied to liquids, the specific heat being given by dividing the product of the time taken by the substance into the mass of the water by the product of the time taken by the water into the mass of the liquid. In determining the specific heat of gases, not only do practical difficulties arise owing to the bulk of the gas, but also there is the theoretical difficulty that gases have a different specific heat according to whether they are allowed to expand when heated or not. This is due to the fact that when a body expands in the open air it does work in pushing back the atmosphere; and this work requires a corresponding amount of heat to be expended. This amount is negligible in the case of solids and liquids, but owing to their great expansibility it becomes appreciable in the case of gases. In order to measure the specific heat of gases at constant pressure, the gas is conducted through a worm heated to a known temperature, and is then passed through a spirally divided chamber immersed in the water in a calorimeter, which is warmed up at the expense of the heat of the gas. The calculation is performed as in the method of mixtures given above. The specific heat of gases at constant volume may be determined by Joly's steam calorimeter, in which a large globe containing the compressed gas is immersed in steam, some of

which is condensed in warming up the gas and globe. Allowance is made for the heat used in warming the globe by making a similar measurement with an empty globe, and the specific heat is calculated from the relation $S.H. = \frac{w \times 536}{w^1 \times t}$, where w is the weight of water condensed, 536 is the latent heat of steam, w^1 is the weight of the gas, and t its rise of temperature. The ratio of the specific heats of a gas at constant volume should be as 1.66:1 if the gas consists of simple particles. This is, however, rarely the case, the ratio varying from 1.42:1 downwards, except in the cases of gases such as argon, helium, and mercury. The reason is that internal work between the parts of the molecule has to be done in most gases, making an addition to both figures of the ratio, and thus approximating it towards unity. The determination of this ratio, which may be carried out by indirect as well as by the above direct methods, affords valuable information as to the complexity of the gas molecule.

With the notable exception of the specific heat of liquid hydrogen, which approaches 6, the specific heats of almost all substances are smaller than 1—i.e. are less than that of water. In the case of most of the solid elements they vary inversely as the atomic weight, the atomic heat or product of atomic weight into specific heat being approximately 6.4. This fact is known as Dulong and Petit's law from its discoverers. It shows considerable divergences from exactness in some cases, particularly with elements of low atomic weight, such as carbon and silicon, in which the specific heat is too small; but the divergence becomes less and less the higher the temperature at which the element is measured. Dulong and Petit's law can be applied to a certain extent to some compounds, but the constancy is confined at best to compounds of similar classes.

A knowledge of specific heats is utilized to determine high temperatures in Siemens's pyrometer, in which a metal cylinder is heated in the furnace and then dropped into water; then if the rise of temperature and mass of the water and the specific heat and mass of the metal cylinder are known, the original temperature of the metal cylinder can be calculated. For a table of the specific heats of the elements see ELEMENTS; and see further Edser's *Heat* (1899), Ostwald's *Physico-Chemical Measurements* (trans. Walker, 1894), and Kohlrausch's *Physical Measurements* (trans. Waller and Proctor, 1873).

Specific Performance. The common law has a remedy for breach of contract in an action for damages; but sometimes damages are no remedy. For example, if A has agreed to buy land because it adjoins his house, damages will not compensate A for breach of this contract. Under certain circumstances, therefore, equity will order a party to specifically perform a contract. But this remedy will not be granted (1) when damages are a sufficient remedy—e.g. a contract for the purchase of ordinary goods obtainable anywhere; (2) when the plaintiff or defendant is unable to complete owing to legal incapacity or otherwise; (3) where the court cannot enforce its order—for example, an injunction cannot make a singer perform a contract to sing if he does not want to; (4) where specific performance would entail unreasonable hardship on the defendant; (5) where there has been misrepresentation or failure of performance by the plaintiff; (6) where the contract is uncertain in its terms; (7) where the performance of the contract would be useless.

Spectacles are frames of nickelled steel or gold, supporting lenses of ground optical glass, and are aids for preserving sight or correcting defects of vision. Spectacle lenses are of two principal classes—spherical and cylindrical—and these in turn are either convex or concave. In some cases compound spectacle lenses are used where the person requires the one pair of glasses to suit both distance and reading. These are called bi-focal, and were first invented by Benjamin Franklin. Torric lenses form another combination; in them a cross cylinder is ground on one part of the surface and a spherical curve on the other half of the glass. Pebble lenses are made from rock crystal. The frames for supporting the two lenses are of two forms—the ordinary spectacle frame with straight sides or curved arms extending to behind the ears, and those which by means of a spring keep in contact with the nose of the wearer, and are called eye-glasses or 'pince-nez.' The latest design, the frameless spectacle, shows the minimum of bridge or spring in the centre, and is in great contrast to the heavy tortoiseshell goggles or horn frames of a century ago.

Spectacles were probably first invented by the Chinese. Alhazen, an Arab writer, makes mention of them in the 11th century, and Italian monks in Pisa and Florence used them in the 13th century. Nuremberg carried on spectacle-making in 1842, and

later the house of Dollond in London and other English makers vied with those of Paris. At the present time the competition is between Britain and America.

There are four general conditions of eyesight which require spectacles. Presbyopia, or old sight, becomes manifest after forty-five years of age, and is noticed when persons cannot read fine print with comfort at fourteen inches distant. Myopia, or near sight, is caused by an over-development of the eyeball, and is noticed when, in order to see clearly, a short-sighted person has to hold his book or work closer to his face than is natural or comfortable. To correct this condition the weakest concave lens is used that will afford the best vision. Hypermetropia, or long-distance sight, is a condition caused by the under-development of the eye, and for this the strongest convex lens is used that will make the distant vision normal. Astigmatism is the condition of the eye which requires the most careful fitting of spectacles. It is a distortion of the image on the retina, caused by the curvature of the cornea being uneven. Nearly every eye exhibits traces more or less of this defect. The test is generally made for this by the light of the retinoscope in the dark room, or by asking the patient to look at certain lines on a card, or at the hands of a clock when they are moved to the different figures. In certain forms of astigmatism the clock hands would not be seen when they were in a vertical position, as at 12.30, but would be distinguished quite clearly when they were horizontal at the hour 9.15. Once spectacles have been used, the eyes should be tested every three years. The following is a homely test to prove whether spectacles may be necessary:—



These discs are equally black and distinct. Hold this four feet from one eye at a time: should one appear blacker than the other, the defective vision is due to astigmatism. The standard test for reading is to read the following passage clearly, when the book is held in a good light at a distance of ten inches from the eyes, each eye being tried separately.

'It is natural for the wonderful accommodative power of the eye to be gradually depleted and the elasticity of the acuteness of vision diminished with advancing years.'

For distant vision the following letters should be placed in a good light at a distance of sixteen feet from the eyes. Each eye should

be tried separately while the person spells each letter.

DMIEF

Spectator, THE. See ADDISON and STEELE.

Spectator, THE. British weekly review, was started in 1828 by Joseph Hume and other Radicals, the editorship being given to Robert Stephen Rintoul. It was he who coined, during the reform agitation of 1830-4, the famous phrase, 'The bill, the whole bill, and nothing but the bill.' Under his control, which endured without a break until his death (1858), the *Spectator* rose to considerable influence and consequence as a literary and political review; but it had declined again when it passed into the hands of Meredith Townsend. He, with the assistance of Richard Holt Hutton, and, after 1885, with that of Mr. St. Lo Strachey, made the *Spectator* the chief exponent of cultured Liberalism. It was unwavering in its support of Gladstone. Hutton's strong views on church questions and his foible for anecdotes of canine sagacity for many years were especially noticeable. In 1886, when Gladstone declared for Home Rule, the *Spectator* withdrew its support. Since Hutton's death (1897) the paper has been owned and edited by Mr. J. St. Lo Strachey.

Spectre of the Brocken. See BROCKEN.

Spectroheliograph, an instrument devised in 1889 by Hale at Chicago for the purpose of photographing the solar prominences. It is essentially a spectroscope with a double slit (as suggested by P. Janssen in 1869), the second slit serving to exclude from the sensitive plate immediately behind it all light except that of one selected quality, usually the K-line of calcium. By giving properly adjusted movements to the several parts of the apparatus, a picture of the object in monochromatic light can thus be built up in sections as its image drifts across the collimator slit. The sun's disc can be similarly photographed in light of any chosen wave-length. The Rumford spectro-heliograph of the Yerkes Observatory was in 1900 the most powerful instrument of its class in existence, but was surpassed by one of eight inches aperture erected on Mt. Wilson in California in 1905.

Spectroscopic Binaries are coupled stars in such close contiguity as to be separable only by the spectroscopic effects of their motion. At quadratures the contrary radial velocities of the stars

attain a maximum, and their spectral lines are observed to be correspondingly displaced; at conjunctions, motion being then directed across the line of sight, they drop to zero, and the lines resume their normal positions. Systems of the kind are very numerous. They are estimated to exist in the proportions of about one in five or six Sirian and solar stars, and of at least one in three helium stars. Three varieties are distinguishable—(1) eclipsing couples; (2) non-eclipsing stars, variable in the period of revolution; (3) pairs constant in light. Algol is the exemplar of the first class; δ Cephei of the second, which at present includes twelve members, consisting, in most cases, of a bright and a sensibly dark star. In the third and most numerous family the companion is also very frequently obscure; Polaris and both the telescopic components of Castor are thus conditioned. The periods of spectroscopic binaries range from a few hours to two and one-third years (that of η Pegasi). At the upper limit they merge into telescopic binaries. No line of demarcation separates the two families; their discrimination depends solely upon visual possibilities. Most of the orbital elements of revolving stars can be calculated from spectroscopic data; their planes, however, evade determination (in non-eclipsing pairs); consequently, their real exceed their measured dimensions to an uncertain degree, and hence only minimum values can be assigned to the masses of the bodies traversing them. A catalogue of 140 spectroscopic binaries was published by Prof. W. W. Campbell in 1905 (Lick Bulletin, No. 79).

Spectrum and Spectroscope.

When a ray of sunlight passes obliquely across the surface of a transparent medium such as glass, it is spread out into a bundle of rays of different colour. The experiment is usually made, as Newton originally made it, by means of a glass prism; and to view the phenomenon at its best the ray should be first passed through a narrow slit parallel to the edge of the prism. The ray then emerges from the farther side of the prism as a broad rectangular strip of rainbow tints, the colour passing gradually from red at the one extremity through orange, yellow, green, and blue to violet at the other end. This strip of colours is called the spectrum of sunlight or the solar spectrum. It demonstrates that white light is composed of a great number of differently coloured constituents, which have different refrangibilities. (See DISPERSION.) The narrow slit is necessary to prevent as far as possible the over-

lapping of the differently coloured rays. The light from any other source may be treated similarly; and in every case a spectrum is formed characteristic of the particular source. Thus an ordinary gas jet will give a spectrum not unlike the solar spectrum; but gas light is not so rich as solar light in blue and violet rays. The electric light, again, gives a spectrum very similar in its broad outlines to the solar spectrum. If we burn salt in a bunsen flame, the flame becomes strongly yellow; and when we examine its spectrum, it is found to consist almost entirely of two bright yellow bands or lines. This is the spectrum of the metal sodium when in an incandescent state, and it is found that line spectra are characteristic of glowing masses of gas or vapour. Not only so, but each gas has a characteristic spectrum of its own, which means that molecules vibrate in definite periods, and send out through the ether radiations of these particular periods. When the substance is in the gaseous state, the molecules vibrate quite freely, and are thus able to emit rays of definite wave-length. When the gas is highly condensed, or when the substance is solid, the molecules have not the same freedom of vibration, so that a confusion of rays of many different wave-lengths is radiated forth into the ether.

When the solar spectrum is looked at very narrowly, or when by means of a lens it is sharply focussed, it is found to be crossed by thin dark lines. These dark lines mean a diminished intensity of light in the rays corresponding to them. This feebleness may be an original property, or it may be the result of a greater absorption by media situated between us and the sun. The latter is the more probable cause, and indeed may be said to be beyond dispute. For example, there are certain of these lines more distinct when the sun is low than when it is high, simply because they are due to the absorptive action of the earth's atmosphere, and the rays from the rising or setting sun have to pass across a much greater breadth of air than the rays from the sun at noon have to do. Moreover, it can be demonstrated, by a direct comparison of the solar spectrum with the bright line spectra of gases and metallic vapours, that many of the dark lines in the solar spectrum correspond accurately with the bright lines of these spectra. Not only so, but they correspond in groups, so that the observer soon recognizes a certain group to belong, say, to hydrogen, a certain other group to calcium, and so on through a

great range of metallic vapours. For example, corresponding to the two well-marked yellow lines in the spectrum of sodium vapour we find in the solar spectrum two well-marked and closely contiguous dark lines occupying in the yellow exactly the position of the sodium lines. This double line is called the D line, that being the name given to it (long before its true significance was known) by Fraunhofer, who was the first to measure the positions of the dark lines, and who named them after the first few letters of the alphabet. We now know that c and f are hydrogen lines, that a characteristic group of three lines in the green called b is due to magnesium, and so on.

For the careful study of the lines in any spectrum an instrument called the spectroscope has been constructed. Its essential parts are a collimator with slit arrangement and lens, a train of prisms, and a telescope with cross wires in the eye-piece, and mounted on a graduated circle, so that its angular position relatively to the direction of the entering ray can be measured. Such an instrument enables us with great accuracy to determine the relative refrangibilities of the different coloured rays which make up any line spectrum, and also the refrangibility of the rays corresponding to the dark rays in the solar spectrum. These dark rays, indeed, form a very convenient set of standard rays with which to describe the optical properties of different kinds of glass and other transparent media. It is found, for example, that though the lines always come in the same order with prisms of different glass, their spacing is different. In short, the law of dispersion varies with the nature of the medium of which the prism is constructed. It is possible, indeed, to form a prism of a material for which the law of dispersion is so peculiar as to show blue and violet light less refrangible than red or yellow light.

There is, however, another way of producing a spectrum in which the lines are arranged in accordance with a very simple law. Such a spectrum is called a 'normal spectrum,' and its great merit is that it gives immediately the relative wave-lengths of the rays which make it up. It is produced by means of a diffraction grating, which consists of a surface ruled with a great many very fine parallel equidistant lines, several thousands to the inch. The surface may be one side of a glass plate, in which case the spectrum is produced by passing light through it, or it may be the surface of a bright reflecting metal, and the spectrum

is then produced by reflecting the light off it. To simplify the description, let the grating be of the latter kind. When it is illu-

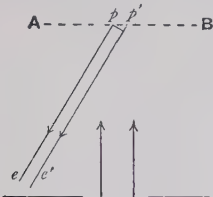


Diagram of Action of Diffraction Grating.

minated by a beam of light falling, say, normally on it, each of the ridges between the ruled lines becomes a centre of disturbance, and is the source of spherical waves radiating out in all possible directions. Let AB be a magnified representation of part of the grating, the short lines being the reflecting ridges, and the gaps the comparatively non-reflecting furrows. Since by superposition the grating is illuminated by a normally incident beam, the waves from the contiguous ridges start in the same phase. Consider the rays pe and $p'e'$, which start from contiguous ridges p and p' and meet at a point in the direction $pe - p'e'$. It is evident that the path $p'e'$ is longer than the path pe by a length, which is represented by the base of the small right-angled triangle formed by dropping a perpendicular from p on $p'e'$. Hence, in accordance with the principle of interference, if this difference is, say, equal to a wave-length of blue light, the blue will be intensified. In directions farther to the side the yellow will be intensified, and in directions still farther the red will be intensified. The result will be the

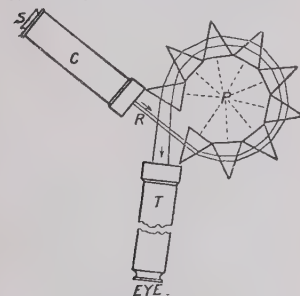
of the spectrum from the grating is to the distance of this part from the incident ray in the same ratio as the distance between the ridges to the wave-length corresponding to that part of the spectrum. These diffraction spectra are formed on both sides of the grating, and on each side there is theoretically an endless succession of them produced by contiguous rays which differ by two wave-lengths, three wave-lengths, and so on. Practically, after the second and third, they become confused by superposition. Professor Rowland of Baltimore greatly improved the construction of diffraction gratings, and his photographs of the solar spectrum are the best we have.

An important use of the spectroscope is in the study of what are called absorption spectra. For instance, when a solution of permanganate of potash is interposed in the path of the ray from a white-hot solid, the spectrum, instead of being of uniform brightness throughout, shows variations of brightness, especially in the green. It becomes fluted in appearance, demonstrating selective absorption in the permanganate of potash solution. Many other substances may be similarly studied, and the absorption spectrum so obtained in any particular case is found to be characteristic of that substance. This method has some valuable applications, as in the study of changes in blood and the colouring matter of plants.

The careful examination of the spectra of different substances forms a practical branch of science known as spectrum analysis. It is, however, in the domain of astronomy that the lessons of the spectroscope appeal most strongly to the imagination. Not only have we learned what substances exist in the cooler regions of the solar atmosphere, but similar knowledge has been attained regarding the constitution of certain stars, nebulae, and comets. The fact that different stars give different dark lines in their spectra proves that these dark lines are mainly due to absorption in the stellar atmospheres. Stars have been grouped in four great classes according to the broad character of their spectra; and each class is believed to indicate a certain stage of decay in the life-history of the stars that belong to that class. When the new star in Perseus blazed out in the year 1901, very remarkable changes were noticed in the nature of the spectrum during the first week of its appearance. The spectrum passed in the course of a day or two from the condition of a continuous and uniformly bright spectrum to that of a faintly continuous spectrum, crossed by bright bands and dark

bands. The dark bands flanked the bright bands on the more refrangible side, which means that the absorbent and probably cooler medium absorbed light of wave-lengths slightly shorter than the wave-lengths of the light emitted by the hotter substance, probably gaseous, which was no doubt the source of the extraordinary but short-lived brilliancy of the star. It is conceivable, however, that these bright and dark bands are really due to the same substance in different physical conditions, in accordance with what is known as the Doppler principle. This principle is a very obvious one when the wave-theory of light is fully realized. For it is evident that the wave-lengths of radiations coming from a luminous source to an observer travelling from or towards that source with a fairly large speed will be altered in virtue of the relative motion. Thus if the observer is approaching the source of light, the waves will come a little more frequently, and the ray will be raised in refrangibility; whereas, on the other hand, if the observer is moving away from the source of light, the waves will seem to come a little less frequently. This is precisely what has been observed to occur in the case of certain stars. When carefully measured by means of a high-power spectroscope, a group of lines due to the presence of some element is found to be slightly shifted towards one end of the spectrum. And the same shift exists in the case of other groups of lines. A shift towards the violet end indicates that the star and observer are approaching each other; a shift towards the red end, that they are retreating from each other. The amount of shift depends upon the ratio of the relative speed in the line of sight to the speed of light, and consequently the spectroscope enables us to measure this relative velocity in the line of sight. By comparison of the spectra of the light coming from the opposite sides of the sun, it has been found possible to measure the rate of rotation of the upper regions of the sun, the Fraunhofer lines in the two spectra being not exactly coincident. See Kayser's *Handbuch der Spectroscopie* (1900-5), and Baly's *Spectroscopy* (1905).

Speculum, in medicine, an instrument used to facilitate the inspection of some passage or recess in the body or the introduction of remedies. Specula are made of various materials, silver or plated metal being much used on account of its reflecting power. Other substances are necessary when caustics or corrosives are to be introduced through the speculum.



Spectroscope.

c, Collimator; p, centre of group of prisms; t, telescope; s, slit through which the ray of light enters; r, ray on its progress through prisms to telescope.

formation of a spectrum, with its violet end nearest to the incident ray and its red end farthest from it. It is easy to show that the ratio of the distance of any part

Speculum Humanæ Salvationis, a rhyming work of the 14th century, dealing with Scripture history commingled with mediæval legends, and traditions especially relating to the adoration of the Virgin Mary.

Speculum Metal is an alloy of two parts copper and one tin, with a trace of arsenic. It is hard, white, and brittle, and can be highly polished. It is used for making the mirrors of reflecting telescopes, but has been largely superseded by silvered glass.

Speculum Perfectionis, a work by Leo of Assisi, which has been recently brought to notice through Sabatier, contains the oldest account extant of St. Francis, having been written about 1227. See P. Sabatier's *Collection d'Etudes et de Documents pour l'Histoire du Moyen Age*; *Speculum Perfectionis*, vol. i. (Eng. trans. by S. Evans, 1898).



Common Speedwell.

1, Flower; 2, section; 3, calyx and pistil; 4, fruit (capsule).

Spedding, James (1808-81), editor of Bacon's *Works*, was born in Cumberland. At Cambridge he was intimate with the Tennysons, Arthur Hallam, and Trench. He was secretary to Lord Ashburton's mission to the United States in 1842, and secretary to the Civil Service Commission in 1855. With these brief exceptions, his life was entirely devoted from 1841 to the study of Bacon. In 1847 a complete edition of Bacon's *Works* was undertaken conjointly with Heath and Ellis, and appeared in 1857-9 in 7 vols., and the *Life and Letters* in other 7 vols. (1861-74). See *Life by Venables* prefixed to his early essay on Macaulay's 'Bacon,' *Evenings with a Reviewer* (1881).

Speed, John (?1552-1629), English historian and cartographer,

was born at Farringdon in Cheshire. Through the generosity of Sir Fulke Greville he was enabled to give up his trade (tailoring) and devote himself to the making of maps of the counties of England (*Theatre of the Empire of Great Britain*, 1611) and to *The History of Great Britain* (1611).

Speed Pulley. See BELT AND ROPE GEARING.

Speedwell, a name given to certain species of plants belonging to the genus *Veronica*, a subdivision of the order Scrophulariaceæ. The flowers have wheel-shaped corollas and two stamens. Among the British species are the thyme-leaved speedwell (*V. serpyllifolia*), a common little prostrate plant, with oval leaves and spikes of light blue flowers; the germander speedwell (*V. chamaedrys*), a little hedgerow plant, with bright blue flowers and hairy stems; the common speedwell (*V. officinalis*), generally found on dry pastures; and the wall speedwell (*V. arvensis*).

Speedy, a British first-class torpedo gunboat (810 tons), launched in 1893. Since 1782 there have been British men-of-war of this name.

Spiese. See METALLURGY.

Spiss, the impure arsenide of cobalt or nickel, obtained on smelting the arsenical ores of those metals.

Speke, John Hanning (1827-64), English African explorer, was born near Ilchester in Somersetshire. After serving in the Crimea, he was associated with Burton in an expedition to discover the traditional equatorial lakes. Tanganyika was fully explored by them, and Speke committed himself to the theory that the Mountains of the Moon circled the north of the lake. This later gave Burton his opportunity to vent the jealousy he felt because on a side expedition Speke discovered Victoria Nyanza, which he was convinced was the source of the Nile. In 1860, accompanied by Grant, Speke renewed his work on Victoria Nyanza, and followed the course of the Nile for some distance; and he gave Baker information which led to the discovery of Albert Nyanza. Burton ridiculed the idea that the lake was the source of the Nile; and the two former associates were to have met in public debate over the question, when news was brought of Speke's death while out shooting. His works are *Journal of the Discovery of the Source of the Nile* (1863) and *What Led to the Discovery of the Source of the Nile* (1864).

Spell. See INCANTATION.

Spelling. See ORTHOGRAPHY.

Spelman, Sir Henry (?1564-1641), English historian and an-

tiquary, was born at Congham in Norfolk. Being a man of means, he devoted himself mainly to research. His *Glossarium Archæologicum* (1626) was undertaken as a preliminary to an investigation of the bases of English law. His chief work, *Councils, Decrees, Laws, and Constitutions of the English Church*, appeared in 1639; and he wrote much on ecclesiastical antiquities, his *History and Fate of Sacrilege* (1698) being the most notable book.

Spelman, Sir John (1594-1643), English author, was the son of Spelman the antiquary, whom he assisted. Born at Hunstanton, in 1625 he became member of Parliament for Worcester, and was an ardent royalist. He published MSS. from his father's collections, and a *History of Alfred the Great* (1678).



Spelt (*Triticum spelta*).

1, Spikelet; 2, calyx (glumes); 3, floret.

Spelt (*Triticum spelta*), a variety of the common wheat (*T. sativum*). It was cultivated by the Romans, and is still grown in certain parts of Europe, notably in the south of Germany and in German Switzerland.

Spelter, an alloy, consisting of about equal parts of copper and zinc, used for hard soldering or brazing. The term is also applied to zinc in the ingot form as produced by the smelter.

Spence, Joseph (1699-1768), English anecdotist and man of letters, was born at Kingsclere in Hampshire. In 1726 he published an *Essay on Pope's Odyssey*, which won him the poet's friend-

ship and the professorship of poetry at Oxford (1728-38). He became rector of Great Horwood and prebend of Durham. In 1747 he published *Polymetis*, a treatise on classical mythology; but he is remembered as the collector of the anecdotes of Pope and his literary circle, which were not published till 1820. See Singer's *Memoir* and edition of *Anecdotes*.

Spencer, a trapezoidal fore-and-aft sail, set between the foremast and the mainmast; a trysail. It is bent to a gaff.

Spencer, tn., Worcester co., Massachusetts, U.S.A., 12 m. w. of Worcester; has manufactures of boots, woollen goods, and wire. Pop. (1900) 7,627.

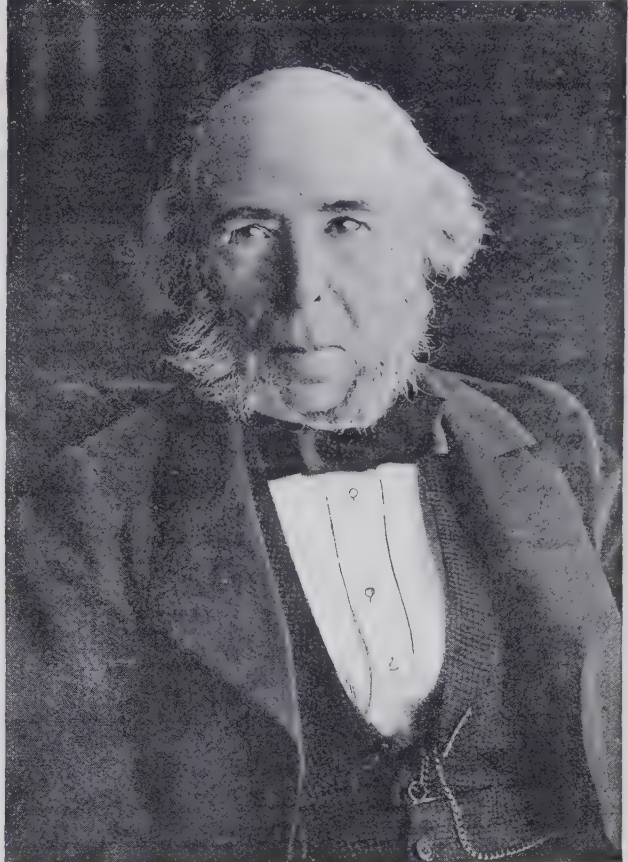
Spencer. See SUNDERLAND, EARL OF.

Spencer, HERBERT (1820-1903), English philosopher, born at Derby. In 1837 young Spencer accepted a position as engineer on the London and Birmingham Ry. For a year and a half he worked in London as a civil engineer, and subsequently for two and a half years on the Birmingham and Gloucester Ry. After the crisis of the great railway mania he had to begin the world afresh (1846). In 1848 he was invited to take the sub-editorship of the *Economist* newspaper; this post he held till 1853. It is a mistake to suppose that when he began his philosophical studies Spencer set himself consciously and deliberately to search for the unifying root of nature's multiform manifestations. At first his mind was mainly directed to questions of a political and social nature. In 1850 appeared *Social Statics*, the object of which was to base his practical views on a coherent set of first principles. It is a common objection to the Spencerian system of thought that it is a revival in modern times of the *a priori* methods of the schoolmen—a kind of materialistic Hegelianism, in which facts are made to fit a preconceived theoretic framework. Nothing could be further from the truth. Spencer began with fact, and stuck by the inductive process; and it was only at a certain stage of his scientific exploration that the thought flashed across his mind that the law of biological and social evolution is a universal process, traceable in the cosmic changes and in the latest results of civilization. His originality consists in the unique manner in which he has combined the two processes, induction and deduction. Even to a greater extent than in England his works have moulded the religious and philosophic thought of the New World. On the Continent his books have been translated by enthusiastic disciples, and among

Oriental thinkers, in India and in Japan, the bold and massive generalization of the Spencerian philosophy have found a congenial home.

What, then, is the precise position which Spencer occupies in the history of philosophic thought? In his *First Principles* (1862) he adopts and approves the Hamiltonian demonstration of the relativity of knowledge, holding that, from the constitution of

ing to him, the one universal and ultimate fact is the redistribution of matter and motion, all phenomena being simply the multiplex and complex phases of the one fact. Evolution is defined as an integration of matter and concomitant dissipation of motion, during which matter passes from an indefinite incoherent homogeneity to a definite coherent heterogeneity, while the retained motion goes through a parallel



Herbert Spencer.

(Photo by E. H. Mills.)

the human mind, knowledge of noumena is impossible. Thus his task was to find the root principle of phenomenal existence. Spencer found the path of discovery cleared by three great generalizations—the universal law of gravitation, the nebular theory, and the doctrine of the conservation or persistence of force. These three isolated generalizations Spencer fused into one by his theory of evolution. Accord-

transformation. In his *First Principles* (1862) Spencer has applied his formula to the evolution of the earth from its nebulous to its present stage. In *Principles of Biology* (1864-7) the problem Spencer set before him was to explain by his evolution hypothesis the structural and functional complexities of plant and animal life. The key to this part of the subject is had, in the Spencerian definition of

life as the continuous adjustment of inner to outer relations. Given an environment gradually increasing in heterogeneity, it follows that, in order to survive and propagate themselves, organisms must, in adapting themselves, also increase in heterogeneity. Through the struggle for existence everywhere going on among organisms there is secured the killing out of the unfit and the survival and perpetuation of those organisms characterized by successful variations, which by the law of heredity become structural and functional. The human organism, in its evolution from the germ cell, summarizes the ancestral development, in being progress from an indefinite, incoherent, protoplasmic homogeneity to the definite, coherent heterogeneity of the fully developed body, through successive integrations and differentiations, all of which are necessitated by the law of the persistence of force. In like manner Spencer, resting on organic evolution, proceeds to trace the course of psychological evolution from the first indefinite unit of feeling to the most complex intellectual processes—instinct, memory, reason being all evolved in the mind by its efforts to maintain the adjustment with the environment. In his *Principles of Psychology* (1855), in tracing back the so-called intuitions of the individual to racial experiences he has dealt with what his followers believe to be a heavy blow to the Kantian and similar philosophies, and has given to the experiential philosophy of Mill and his school the scientific basis of which it stood in sore need. Philosophy, dealing with evolution, not with origination, can throw no light on the great cosmical mysteries of beginnings and endings. Here the mind is baffled, and thus we are brought to the religious aspect of the evolution philosophy—worship at the altar of the Unknown and Unknowable. Spencer's other books include *Principles of Sociology* (1876), *Principles of Ethics* (1892), *Education* (1905). See Spencer's *Autobiography* (1904), Hudson's *Herbert Spencer* (1894), and Macpherson's *Herbert Spencer: the Man and His Work* (1900).

Spencer, WILLIAM ROBERT (1769–1834), English poet and wit, grandson of the third Duke of Marlborough; became commissioner of stamps (1797–1826). Pitt, Fox, Sheridan, and Sydney Smith were his friends. His works include translation of Bürger's *Leonore* (1796); *Urania*, a burlesque (1802); *The Year of Sorrow*; *Poems* (1811); ed. with Memoir (1835).

Spencer Family. CHARLES SPENCER (1706–58), fifth Earl of

Sunderland, on becoming (1733) third Duke of Marlborough, assigned the Sunderland estates to his younger brother, John, father of JOHN SPENCER (1734–83), created first Earl Spencer (1765). The second earl, GEORGE JOHN SPENCER (1758–1834), eldest son of the preceding, brother of Georgiana, the beautiful Duchess of Devonshire, represented, as Lord Althorp, Northampton (1780) and Surrey (1782) in the House of Commons, and reached the Upper House in 1783. A supporter of Burke on the French revolution question, he became (1794) keeper of the Privy Seal, first lord of the Admiralty (1794–1801), home secretary under Fox (1806–7), and first president and part founder of the Roxburghe Club (1812). He built up the famous Althorp Library, acquired (1892) by Mrs. Rylands for the John Rylands Library in Manchester.—JOHN CHARLES SPENCER, the third earl (1782–1845), eldest son of the preceding, was member of Parliament for Oakhampton (1804); junior lord of the Treasury (1806); chancellor of the Exchequer under Earl Grey (1830), when he bore the brunt of the Reform Bill debate; attained the peerage (1834); and when the Whigs left office devoted himself to agricultural interests, originating, and becoming first president of, the Royal Agricultural Society (1838).—FREDERICK SPENCER, fourth earl (1798–1857), younger brother of the preceding, became member of Parliament for Worcestershire (1831) and Midhurst, and a peer (1845). From 1846–8 he was lord chamberlain and lord steward (1854).—JOHN POYNTZ SPENCER, fifth earl (1835), entered Parliament in 1857, but in the same year was elevated to the peerage. In 1868–74, in Gladstone's first ministry, he was lord-lieutenant of Ireland. When Gladstone came into power again in 1880 Lord Spencer was given the lord presidency of the council. But in May 1882 Lord Cowper, lord-lieutenant of Ireland, and Mr. W. E. Forster resigned their seats in the cabinet owing to disagreement with the government's Irish policy, and Lord Spencer and Lord Frederick Cavendish were appointed to the respective positions. The administration of Lord Spencer during the succeeding three years, particularly in reference to the trial and execution of the Phoenix Park murderers, and of Myles Joyce for the Maamtrasna murder in 1884, was the object of the most bitter and venomous attack by the Irish parliamentary party. A year after he had returned from Dublin Castle and declared in favour of Gladstone's Home Rule policy

for Ireland, the same men lavished the most fulsome adulation upon him. In the Home Rule government (1892–5) Earl Spencer filled the post of first lord of the Admiralty. For third earl, see *Memoir* by Sir Denis Le Marchant (1876), *Biographical Studies* by Bagehot (new ed. 1895), and *Lord Althorp* by E. Myers (1890).

Spener, PHILIP JAKOB (1635–1705), the father of German Pietism, was born at Rappoltsweiler in Alsace. He became public preacher at Strassburg in 1662, and from 1666 at Frankfurt-on-Main. His attacks on Calvinism attracted much attention, but he gradually adopted a more spiritual and less aggressive style, and in 1670 instituted the *collegia pietatis*, from which arose the sect of the Pietists. In 1675 he published his *Pia Desideria*, which urged Christian charity and humility of faith. In 1686 he was made court preacher at Dresden. There the clergy combined against his teaching. A dispute with the University of Leipzig led to the condemnation of his religious meetings, after which he changed (1691) his residence to Berlin. The University of Halle became the centre of Spener's 'pietism.' See *Life* in German by Hossbach (ed. 1861) and by Wildenhahn (Eng. trans. 1881).

Spennymoor, mrkt. tn., Durham, England, 5 m. s. of Durham. Coal is mined, and there are steel works. Pop. (1901) 16,661.

Spenser, EDMUND (c. 1552–99), English poet, was born in London, being akin to the Spencers of Althorp. In 1576 he retired to Hurstwood in Lancashire, where he wrote verse in the pastoral vein in honour of his Rosalind, who has not been satisfactorily identified, but was possibly Rose Dineley of Clitheroe. In 1578 he came to London, became a member of the Earl of Leicester's household, and acquainted with Sidney and Sir Edward Dyer; joined with them and Harvey in the literary coterie known as the 'Areopagus,' and experimented in the adaptation of classical metres to English verse. The publication of *The Shepherd's Calendar* in 1579 brought him literary fame. In 1580 he went to Ireland as secretary to the lord-deputy, Arthur, Lord Grey de Wilton. In 1581 he was made clerk of the Irish Court of Chancery. He also obtained grants of land at New Abbey, Co. Kildare, and elsewhere. He looked upon himself as an exile, but worked away at *The Faerie Queene*, and in 1588 became clerk of the council of Munster. During the plantation of Munster he obtained a grant of Kilcolman Castle, Co. Cork, the Mulla of

his verse. He had litigious neighbours in Lord Roche and others, and a congenial one in Sir Walter Raleigh at Youghal. From 1589-91 he was in England, and published the first part of *The Faerie Queene* and other poems. By this time Spenser had become the leading influence in



Edmund Spenser.

English letters. He returned to Ireland, and wrote his autobiographical *Colin Clout's Come Home Againe* (1595). His courtship and marriage of Elizabeth Boyle in 1594 produced the *Sonnets* and *Epithalamion*, and in the same year he resigned his clerkship. But in 1597 he once more returned to Ireland, and in 1598 he was sheriff of Cork. Kilcolman Castle was burnt during the rising of the Earl of Tyrone in the same year. Spenser fled to Cork, and thence went to London to plead the wrongs of the Munster colonists. Here he died in poverty, according to a more than doubtful legend, and was buried in Westminster Abbey. Poems—*The Shepheard's Calendar* (1579; ed. H. O. Sommer, 1890; ed. C. H. Herford, 1895); *The Faerie Queene* (1590-6; ed. G. W. Kitchen, bks. i., ii. 1868-71; ed. K. M. Warren, 1897-1900); *Daphnida* (1591); *Prothalamion* (1596). Prose Works—*View of the Present State of Ireland* (1633). Collected Works (1611; ed. J. P. Collier, 1862; ed. R. Morris, with Life by J. W. Hales, 1869; ed. A. B. Grosart, 1880-2). Biography and Criticism—T. Warton's *Observations on the Faerie Queene* (1754); G. L. Craik's *Spenser and his Poetry* (1845); W. J. Courthope's *Genius of Spenser* (1868); F. G. Fleay's *Guide to Chaucer and Spenser* (1877); R. W. Church's *Life of Spenser* (1879); F. I. Carpenter's *Outline Guide to Study of Spenser* (1894).

Spermaceti consists chiefly of cetyl palmitate, $C_{15}H_{31}COOC_{16}H_{33}$, along with smaller quantities of similar compounds. It occurs in the oil of the sperm and allied whales, particularly in the portion obtained from the head cavities, from which it separates in the solid state on cooling. After purification, spermaceti forms a snow-white, almost odourless, crystalline solid of specific gravity '94, that melts at about $45^{\circ}C$, and is insoluble in water, but dissolves in hot alcohol and ether. It is apt to become rancid on keeping, and is often adulterated with paraffin, fats, and fatty acids. It is used as an ingredient of ointments and for making candles; the candles used as a standard of luminosity are made of it.

Spermatozoa. See REPRODUCTION and SEX.

Sperm Oil consists chiefly of dodecatyl oleate $C_{17}H_{33}COOC_{12}H_{25}$, along with similar esters of the higher monohydric alcohols, and thus differs materially from animal and vegetable oils, which are glycerol derivatives. Sperm oil is obtained from the cachalot or sperm whale. The bottle-nose whale yields a similar product—a thin, pale yellow liquid of specific gravity about '88, and of more or less fishy odour. It does not readily become rancid or gummy, and is thus a valuable lubricant.

Spermophyta. See PHANEROGAMIA.

Sperm - whale. See CACHALOT.

Sperrylite, a platinum arsenide, $PtAs_2$, found in the nickel mines of Sudbury in Canada.



Sphenodon.

Speusippus, ancient Greek philosopher, was a native of Athens, and nephew of Plato, whom he succeeded as the head of the Academy (347 to 339 B.C.). All his works are lost.

Spey, second longest river of Scotland; rises between Badenoch and Lochaber, Inverness-shire, and flows 110 m. in a N.E. direction to Moray Firth.

Speyer. See SPIRES.

Spezia (near anc. *Portus Lunæ*), strongly fort. tn. and summer resort, prov. Genoa, Italy, on bay of same name, 56 m. by rail S.E. of Genoa; is the chief naval station and arsenal in Italy. A new port has been made to the E. There are shipbuilding yards and docks. In the bay Shelley lost his life. Pop. (1900) 63,163.

S.P.G., Society for the Propagation of the Gospel.

Sphærosiderite. See CLAY IRONSTONE.

Sphagnum, a genus of mosses, commonly known as bog-mosses from their usual habitat. They have erect stems several inches long, and bear the male organs on lateral stems, somewhat resembling catkins, and the female organs on shorter lateral stems, resembling buds. The sphagnum grows in compact masses, often covering large areas. They are much used by gardeners, especially in connection with the cultivation of orchids, chiefly by reason of the large quantity of water which they absorb and yield up according to the needs of the plant.

Sphene, or TITANITE, calcium silicate and titanate, $CaSiTiO_6$, and a common rock-forming mineral of the acid rocks, such as granite, rhyolite, trachyte, and syenite. It has a very strong double refraction and considerable dispersive power ($\mu = 5$; sp. gr. 3.5). Fine specimens of dark brownish green colour are used as gems, though they are too soft to be of great value. The best stones are found in the gneiss of the Alps, especially Tyrol.

Sphenodon, or HATTERIA, the genus name of a New Zealand lizard (*S. punctatum*). It is the only living member of the order Rhynchocephalia, and in many respects displays archaic characters, known elsewhere only among fossil forms. The usual length is under two feet. There is a long tail, which is strongly compressed, and both fore and hind limbs each bear five toes, which are

clawed and webbed at their bases. The upper parts of the body are clothed with small scales, intermixed with tubercles, while a crest of spines runs from the posterior part of the head down the body to the tail, but is interrupted in the neck region. It excavates burrows, in which it remains for the greater part of the day, emerging in search of food in the evening. The food always consists of small living animals, but some eat crustaceans, others insects and worms, others fish. The animals are fond of lying in water, and can remain below the surface for a prolonged period. The eggs are deposited in a hole in sandy soil during the summer, but do not hatch till about thirteen months afterwards. The embryos apparently undergo what corresponds to a summer sleep within the shell. It would seem also that the mortality among the embryos is very great, relatively few hatching out. The following are among the more generally interesting features: the quadrate, the bone to which the lower jaw is attached, is fixed to the skull, and not movable as in lizards and snakes; the vertebræ are cupped at both ends, as in fish and the primitive reptiles, instead of having the ball and socket arrangement usual in living reptiles; as in crocodiles, there are abdominal ribs on the ventral wall of the abdomen; the wrist bones show no signs of fusion, the primitive number of ten bones being present. But the special peculiarity is the fact that the pinal body of other vertebrates—a curious structure found in the brain, which was long an entire puzzle—here takes the form of a median unpaired eye, which retains traces of the retina, and lies beneath a hole in the bones of the skull. Generally, Sphenodon is a specialized remnant of the stock from which the other existing reptiles arose.

Sphenoid Bone, a large and important wedge-shaped bone of the skull, made of several bones ossified into one. See SKULL.

Sphere, in astronomy, the hollow vault of the sky upon which the heavenly bodies are seen projected. Its momentary centre is at the eye of the observer; its surface is conceived to be indefinitely remote. Hence, parallel lines produced to meet it, such as meteor-tracks, or the earth's axis during its annual revolution, converge to a single point. The situations of objects on the sphere are defined by reference to two alternative systems of polar co-ordinates. Aristotle assigned seven spheres, centred on the earth, to the sun, moon, and five planets, and an eighth to the fixed stars; Arab astrono-

mers added a ninth, the 'primum mobile,' exterior to the rest, and imparting to them revolution in twenty-four hours. The purely ideal 'homocentric spheres' of Eudoxus became subsequently materialized into crystalline orbs, finally shattered by the incursion of the comet of 1577 as determined by Tycho Brahe.

Sphere, in mathematics, a surface every point of which is equally distant from a fixed point known as the centre. Every plane section of a sphere is a circle—known as a great circle, if the plane be diametral. Two spheres intersect in a circle whose plane is at right angles to the join of their centres. A sphere may be described through any four points, as a circle may be described through any three. The shortest line in the surface joining any two points is an arc of a great circle. Also for a given surface the volume of the sphere is a minimum. The cartesian equation to the sphere is a particular case of the general equation of the second degree, and is obtained by equating to a constant r (the radius) the length of the straight line joining the centre to any point on the surface. Volume of sphere, $\frac{4}{3} \pi r^3$; surface of sphere, $4 \pi r^2$.

Sphere, THE, was founded in 1900 by Mr. Clement Shorter as an illustrated weekly, representing the latest developments in the art of illustration. It had its own special artists at the front during the South African War.

Sphere of Influence, a comparatively modern development of international politics. This and cognate phrases date practically from the conference of Berlin in 1884. In 1885 arrangements were entered into between Great Britain and Germany relative to their respective spheres of action in portions of New Guinea. Other similar agreements were made in relation to the British and German spheres of influence in the Western Pacific (1886); with Russia in regard to Lake Victoria and the Pamirs (1895); with France in reference to Siam (1896), Egypt (1899), and Morocco (1904). Mr. W. E. Hall, in his *International Law* (1904), says the expression indicates 'the regions which, geographically, are adjacent to, or, politically, group themselves naturally with, possessions or protectorates' in which 'control can be exercised with tolerable regularity,' and represents 'an understanding which enables a state to reserve to itself the right of excluding other European powers from territories that are of importance to it, politically, as affording means of future expansion to its

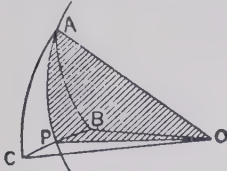
existing dominions or protectorates, or, strategically, as preventing civilized neighbours from occupying a dominant military position.'

Spherical Aberration. See ABERRATION, SPECIAL; LENSES; and MICROSCOPE.

Spherical Harmonics, a mathematical method of great value in the investigation of distributions of attracting and repelling 'matter' (gravitational, electrical, or magnetic), which act on other distributions of the same kind according to the Newtonian law of the inverse square. The method originated with Laplace, and consists analytically in finding forms of functions of position which satisfy a particular differential equation. All such functions are known as potential functions. When found for any region of space, the potential function gives at once, by its rate of change in any direction, the force acting in that direction. Now, just as any simply periodic function can be expanded as a Fourier series, in terms of sines and cosines of successive integral multiples of the variable, each term representing a simple harmonic function, so here any potential function can be expressed as a series of ascending or descending powers of a certain variable, the coefficients being definite, assignable functions of the sines and cosines of the spherical co-ordinates which fix the position of a line in space, say, for example, the latitude and longitude of a point on a spherical surface. Laplace applied the method to the calculation of the attraction of a spheroid like the earth; Gauss made it the basis of his theory of terrestrial magnetism; and important contributions to the theory have been made by Legendre, Kelvin, Dirichlet, Jacobi, and others. See Thomson and Tait's *Natural Philosophy* (1879), Heine's *Kugelfunctionen* (1878-81), Todhunter's *Elementary Treatise on Laplace's Functions* (1875), and special chapters in Byerly's *Fourier's Series* and *Spherical Harmonics* (1895), and in Whittaker's *Modern Analysis* (1893).

Spherical Triangle and Spherical Trigonometry. When any three points on a spherical surface are joined by arcs lying wholly on the surface, the arcs form what is called a spherical triangle. Each of the arcs so drawn is always understood to lie in one plane; and, unless there is a statement to the contrary, the planes in which the arcs lie are always understood to pass through the centre of the sphere. In other words, the arcs are parts of great circles. The

relations among the arcs, and the angles between each pair of planes containing the arcs, form an important branch of mathe-



Spherical Triangle.
O, Centre of sphere.

matics known as spherical trigonometry. It is indispensable for the astronomer and geodetic sur-

Spheroid is the surface generated by the rotation of an ellipse about either its major or its minor axis. When the major axis is the axis of rotation, the surface is a prolate spheroid somewhat like an egg. When the minor axis is the axis of rotation, the spheroid is oblate. The figure of the earth is approximately an oblate spheroid. The spheroid is a particular case of the ellipsoid.

Sphecx, a genus of fossorial Hymenoptera, belonging to the family Sphegidae. It has attracted special attention from the peculiar habits, first studied by Fabre. The female excavates horizontal galleries in the soil, usually ten in number, with each

pupil of eye, mouth, rectum), which they either constrict or close when it contracts, the muscular fibres being arranged in a more or less circular fashion.

Sphinx, in ancient Greek legend, was a she-monster, which appeared in Bœotia, and killed all the inhabitants who could not solve a riddle which she propounded to them. The riddle was—'What animal is it that has four feet, and two feet, and three feet, and only one voice; yet its feet vary, and when it has most it is weakest?' Edipus answered rightly, 'Man'; for he crawls on all fours as an infant, and in old age moves on his feet and a staff. Upon this the Sphinx slew her-



The Egyptian Sphinx at Gizeh.

veyor. The solution of a spherical triangle can be made to depend on the solution of the right-angled spherical triangle—that is, the triangle two of whose arcual sides lie in perpendicular planes. Thus the spherical triangle ABC may at once be divided into two right-angled spherical triangles by simply drawing through one vertex, say A, a plane perpendicular to the plane BC containing the other two vertices. This will form on the spherical surface an arc AP meeting the arc BC, produced if necessary, in the point P. The triangles APB and APC are two right-angled spherical triangles.

of which are connected three or four cells intended for the young. The cells are fully provisioned and closed up, and the whole gallery is abandoned. The provisions consist of three or four crickets, which are stung by the sphecx or wasp in three spots, corresponding to the position of the three chief nerve-centres. The result is that the cricket is paralyzed, but not killed. When the sphecx larva hatches, it consumes the living crickets. Later, pupation occurs, and the imago emerges from the ground to begin the life history anew.

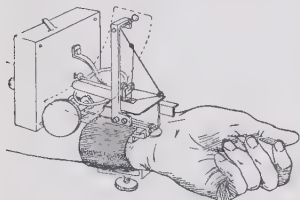
Sphincter Muscles surround an opening or a short canal (e.g.

self. The idea of the Sphinx came to Greece, no doubt, from Egypt. But in Egypt the Sphinx is represented as a lion without wings, with a human head; while the Greek Sphinx is a winged lion, with a woman's breast and head. See Sophocles's *Edipus Tyrannus*.

Sphinx. See HAWK-MOTH.

Sphygmograph, or PULSOMETER, an instrument for recording the movements of the arterial wall during and between the pulsebeats. One of the earliest forms was invented by Marey, and consists of a lever with an elastic spring. One end of the spring is placed on the radial artery, and

has above it a rack and pinion attached to a lever. The other end of the lever carries a style, which records on a moving smoked plate the movements of the vessel wall. The smoked plate is moved at a known rate by clockwork, and the pressure of the spring upon the artery can be regulated by a screw. A most convenient instrument is Dudgeon's sphygmograph, in which clockwork moves a strip of smoked paper below a style



Dudgeon's Sphygmograph.

attached to a spring that rests on the radial artery. The writing levers are so adjusted that the movements of the arterial wall are magnified fifty times. Besides yielding much valuable information about the frequency, strength, and regularity of the cardiac pulsations, the sphygmograph records the tension of the pulse, which is often altered by morbid changes in the blood pressure and in the vessel walls.



Normal Pulse Curve.

Spica (*a Virginis*), in astronomy, a helium star of 1.2 magnitude, representing the ear of wheat held by the zodiacal Virgin. Vogel discovered it in 1890 to be a spectroscopic binary, revolving in four days round a semi-obscure companion.

Spica. See BANDAGE.

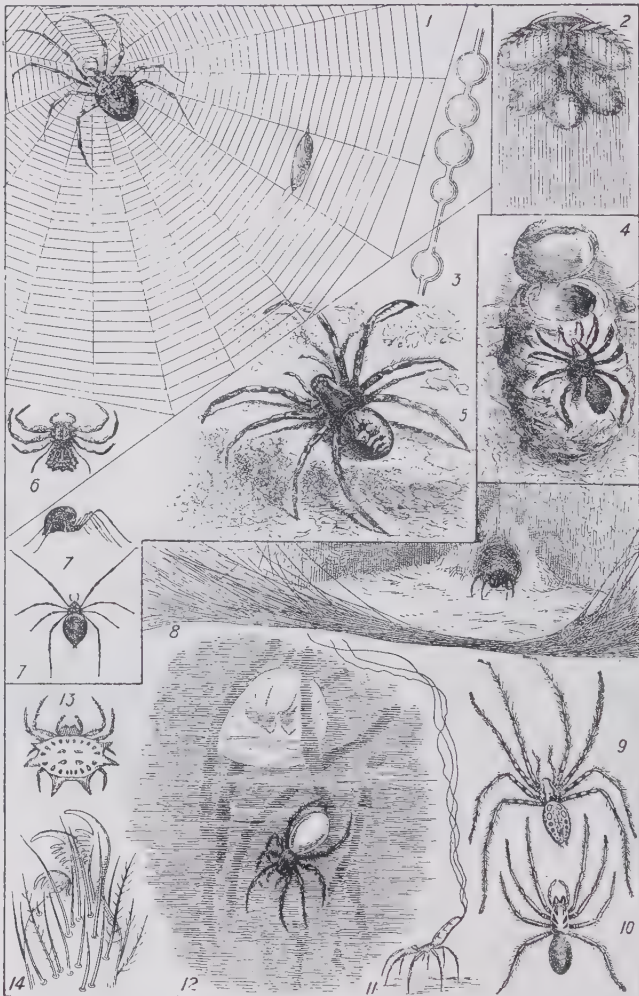
Spice Islands. See MOLLUCAS.

Spices, vegetable products with a definite and pronounced taste, used for adding flavours to simpler foods, usually to articles of food which contain sugar. They are distinguished from condiments, which are commonly used with meat or meat substitutes, or with other substances containing salt. Among the chief spices are cassia, cloves, ginger, mace, nutmegs, cinnamon, pepper, pimento, caraway, and coriander.

Spicheren, vil., Lorraine, Prussia, 3 m. S. of Saarbrück; was the scene of a defeat of the French under Frossard by the Germans, Aug. 6, 1870.

Spider. The spiders constitute the specialized order Araneida of the class Arachnida.

rounded abdomen. The appendages of the cephalothorax consist of two small chelicerae close to the mouth, which here contain the poison gland used in obtaining prey; the pedipalps, or second pair of appendages, which are not chelate at the extremity;



Spiders.

1. Garden spider (*Epeira diadema*) and web. 2. Spinneret of spider. 3. Enlarged view of spiral thread of web, showing viscid globules. 4. Trap-door spider. 5. *Lycosa tarantula*. 6. *Thomisus folia*. 7. *Latrodectus Menavidii*. 8. Platform web of house spider. 9. House spider (*Tegenaria domestica*). 10. *Segestria perfida*. 11. *Tetragnatha* 'sailing' by means of loose webs. 12. Water spider and nest. 13. *Gasteracantha cancriformis*. 14. Foot of garden spider, showing 'combs' for clinging to web.

The specialization, as compared with the scorpion, is shown in the absence of apparent segmentation, and in the shortening of the body, which consists of an anterior cephalothorax, separated by a constriction from the large,

and four pairs of walking legs. On the ventral surface of the abdomen in most spiders are the openings of a pair of lung-sacs, but a few have two pairs of these structures. In most spiders there are also present tracheal tubes

comparable to those of insects; the spiders therefore illustrate the transition between these two modes of breathing. The other structural peculiarities include the spinnerets at the end of the abdomen; these are little tubercles perforated by a great number of holes, through which exudes the silk of which the web is made. The mouth is minute, as is also the lumen of the alimentary canal; for the spider does not take solid food, but feeds upon animal juices. The nervous system shows much specialization, and there are numerous eyes on the head region. The sexes are separate, the males being smaller than the females. The prey is usually entangled in the web or lures, and killed by the poison glands of the chelicerae. The web is very varied in shape and structure. The orb form is well seen in that of *Epeira diadema*, the common garden spider, where there is a well-marked difference between the radial lines which form the scaffolding of the web and the viscid circular ones which catch the insects. Other species use the silk to make snares or traps (cf. the trap-door spider). Another interesting point is the frequency of what is known as protective coloration among spiders. There are a very large number of spiders, the majority of which have two lung-sacs, while relatively few (like *Mygale*, the bird-catching spider) have four. The common spider of houses is *Tegenaria domestica*; the water-spider is *Argyroneta aquatica*; while *Lycosa tarantula* is the tarantula spider, whose poison is unusually powerful. See M'Cook's *American Spiders and their Spinning Work* (1890-4), Moggridge's *Trap-door Spiders* (1872), Thorell's *European Spiders* (1870), and *Camb. Nat. Hist.*, vol. iv. (1905).

Spider-crab. See CRAB.

Spider-fly, a name sometimes given to the sheep-louse.



Spraer-monkey (Ateles paniscus).

Spider-monkey (Ateles), a genus of New World monkeys, whose members are characterized

by the slender body, the very long prehensile tail, and the elongated, spider-like limbs. On the fore limbs the thumb is absent. The best-known species is *A. paniscus*, sometimes called the coaita, in which the fur is black, while the naked parts of the face are reddish. This monkey is readily tamed, and is a favourite S. American pet. There are a considerable number of other species, all purely arboreal in habits, and remarkable for their extreme agility.

Spiegel-eisen, or MIRROR-IRON, a pig-iron containing from about ten per cent. to forty per cent. of manganese and about five per cent. of carbon, prepared by smelting manganiferous iron-ores in a blast furnace. When broken, it forms large crystalline plates of very lustrous appearance, from which it derives its name. It is used to add to the molten pure iron of the Bessemer and open-hearth processes in order to obtain steels.

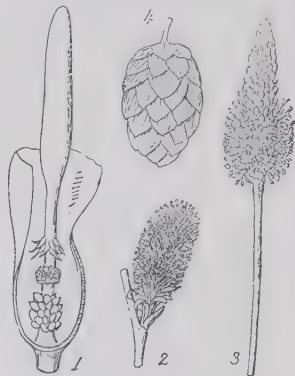
Spiegelberg. See BRÜNN.

Spiehlagen, FRIEDRICH (1829), German novelist, born at Magdeburg. He produced novels of the Young German school, influenced by Gutzkow, well constructed in plot, but somewhat over-weighted with moralizings. These placed him in the front rank of authorship. They include *Problematical Natures* (1861; 9th ed. 1890), with sequel, *Through Night to Light* (1862); *Hammer and Anvil* (1869; 8th ed. 1881); *Storm-Floods* (1878); *Noblesse Oblige* (1888); *A New Pharaoh* (1889); *Faustulus* (1897); *Ever Forward* (1872); *What the Swallow sang* (1873); *The Hohensteins* (1864); *Rank and File* (1866); *Low Land* (1879); *Love for Love* (1875); *Quisisana* (1880). See Study by Karpeles (1889).

Spiehlmann, MARION HARRY (1858), English art critic and author, born in London; was an engineer till 1884. He soon turned to literature, and contributed to the *Pall Mall Gazette* (1883-90), *Daily Graphic*, and *Graphic* as art critic (till 1891); *Black and White* as art editor (1890). Spiehlmann was editor of the *Magazine of Art* from 1887 till its stoppage in July 1904. (See MAGAZINE OF ART.) In 1886 he published a *Pall Mall* extra on 'The Works of Mr. G. F. Watts, R.A.:' also *Henrietta Ronner* (1891), *The Hist. of Punch* (1895), *Millais and his Works* (1898), *Thackeray* (1899), *Ruskin* (1900), *Chaucer's Portraits* (1900), *Charles Keay* (1903), and *The Art of John MacWhirter*, R.A. (1904).

Spigelia, a genus of American herbaceous plants belonging to the order Loganiaceae. They bear spikes of yellow, red, or purple flowers, and a few species are sometimes grown in English gardens.

Spike, an inflorescence in which the flowers are arranged without stalks along a simple, undivided axis, as in the plantain. Strobilus, spadix, and amentum are



Forms of Spike.

1. Spadix (arum). 2. Catkin (willow). 3. Spike (plantain). 4. Strobilus (hop).

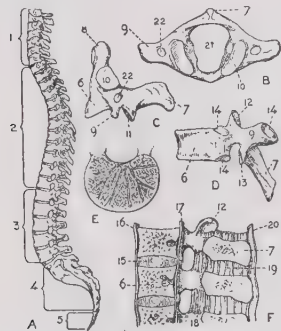
terms used to indicate special forms of spikes, as illustrated by the inflorescences of the hop, the arum, and the willow respectively.

Spikenard, or NARD, a hardy perennial Himalayan herbaceous plant belonging to the order Valerianaceae. It has a thick, fusiform root, which is very fragrant, and it bears dense heads of reddish flowers in late autumn. It is quite easy of cultivation in ordinary soil. As a perfume and as a stimulant medicine, spikenard root has always been held in great esteem in the Orient.

Spiking Guns is now practically an obsolete term. It applied to muzzle-loaders, fired from a vent or touch-hole in the breech, which was closed by driving into it a cast-iron spike, afterwards broken short off by a hammer. The only remedy was drilling another vent, a long and tedious process. The modern equivalent is the removing or destroying of the breech-block and the sights of the gun.

Spina Bifida, or CLEFT SPINE, a condition due to arrest of development in some vertebrae, resulting in the protrusion of the spinal cord and its membranous coverings. It may occur in any part of the spinal column. The appearance is that of a tense, fluctuating tumour, covered often by only a very thin skin. The condition is generally fatal within a few days or weeks after birth. But sometimes the condition is spontaneously cured by the gradual oozing away of the cerebrospinal fluid and the closure of the aperture in the column. Injections of iodine sometimes succeed by inducing absorption.

Spinach seems to have been known as a kitchen vegetable in the 14th century, though it does not appear to have been grown in English gardens before the 16th. To grow spinach, the soil should be deeply dug and moderately rich. The seed should be sown in drills about a foot apart, at intervals from March to August, the young plants being thinned out to six or eight inches from plant to plant.



Spinal Column.

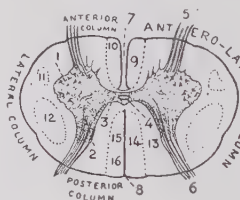
A. The spinal column, side view. B. Atlas (1st cervical vertebra) from above. C. Axis (2nd cervical vertebra), side view. D. Dorsal vertebra, side view. E. Section of a lumbar vertebra, showing structure. F. Section of two lumbar vertebrae, showing ligaments. 1, Cervical; 2, dorsal; 3, lumbar vertebrae; 4, sacrum; 5, coccyx; 6, body of vertebra; 7, spinous process; 8, 9, transverse process; 10, superior articular surface; 11, inferior; 12, superior articular process; 13, inferior; 14, articulation for rib; 15, inter-vertebral substance; 16, anterior common ligament; 17, posterior; 18, ligamenta subflava; 19, interspinous ligament; 20, supraspinous ligament; 21, foramen for spinal cord; 22, foramen for blood-vessel.

Spinal Column, called also **SPINE**, **BACKBONE**, or **VERTEBRAL COLUMN**, consists in man of thirty-three bones, of which in the adult the four lowest are united to form the coccyx, and the five above the coccyx are fused together as the sacrum. Of the others, the seven highest, which are situated in the neck, are called cervical; the next twelve lie between the shoulders and the waist, and are known as dorsal; while the remaining five, the lumbar vertebrae, are situated immediately above the sacrum. Each vertebra consists of two essential parts—an anterior solid segment or body, with concave surfaces above and below, and a posterior hollow segment or arch. The vertebrae are superimposed one upon the other, so that the bodies make a strong solid pillar, while the arches form a continuous bony canal behind. Between each pair of vertebrae apertures exist for the spinal nerves arising from the spinal cord within the canal. The two highest cervical vertebrae present characteristic modifications

in connection with the movements of the head, the upper being known as the atlas, and the second as the axis. The atlas has no body, but is a mere bony ring, capable of rotation around the odontoid process of the axis. All the cervical vertebrae have the transverse process on each side pierced by a foramen, through which the vertebral artery and vein pass. The spine is thick and nearly horizontal in direction. It furnishes attachment for the strong ligamentum nuchæ or ligament of the neck. Its average length is about two feet two inches. Viewed laterally, the spine presents several curvatures which correspond with its different regions. The cervical curve is the least marked, and is concave backwards, the dorsal is concave forwards, the lumbar is concave posteriorly, while below the lumbar region the sacrum and coccyx form the pelvic curve, which has its concavity looking forwards. From the greater traction exercised by the muscles of the right arm, the dorsal region of the spine generally presents a lateral curvature, the convexity of which is towards the right side, and also a slight compensatory curve of an opposite nature in the lumbar region. The cartilages between the vertebrae form in the aggregate nearly one-fourth of the total length of the spine; but they are not uniform in thickness, being thinner in the dorsal than in the cervical and lumbar regions, which have, consequently, greater pliancy and mobility. The ligaments of the spinal column are mostly characterized by the large amount of elastic tissue which they contain, and which serves to maintain the upright position with but little expenditure of muscular energy. The transverse ligament of the atlas stretches across the ring of that bone, and retains the odontoid process of the axis in the anterior arch. Death by hanging is due to the rupture of this ligament, as a result of which the odontoid process crushes the medulla oblongata and destroys the vital centres. Strong ligaments also connect the occipital bone with the axis and with the atlas. The spinal column is the central support for the framework of the body. The maximum of movement between two adjacent vertebrae is very slight, but the aggregated movements of several such joints amount to a considerable range of mobility. The curvature of the spine adds to its strength, and confers upon it the properties of an elastic spring. It thus dissipates the force of a fall instead of transmitting it to the head as a rigid and straight column would

do. The spine also forms an armoured flexible tube for the protection of the delicate spinal cord.

The spinal column may be the seat of sprains, fractures, or dislocations, as well as of synovitis in one or more of the many synovial joints. Sprains are apt to be associated with persistent pain, and are often followed by rheumatic inflammations. Fractures and dislocations are attended by the serious risk that the spinal cord may suffer either laceration or compression. Dislocation of the spine without fracture is impossible except in the cervical region, and there it is uncommon. For Pott's disease of the spine and for abnormal curvatures, see HUNCHBACK.



Diagrammatic Section of Spinal Cord in cervical region.

1, Anterior cornu of gray matter; 2, posterior cornu; 3, commissure; 4, central canal; 5, anterior nerve root; 6, posterior; 7, anterior median fissure; 8, posterior; 9, fasciculus of Goll; 10, antero-internal column; 11, probable tract of sensations of pain, heat, and cold; 12, crossed pyramidal tract; 13, posterior column; 14, postero-internal column of Goll; 15, tract for sensation of touch and muscular sense; 16, postero-medial, or postero-internal column, or column of Goll.

Spinal Cord, the elongated cylindrical part of the central nervous system. It is usually about sixteen inches in length, and does not nearly fill the spinal canal, its investing membranes being separated from the bony wall by areolar tissue and a plexus of veins, as well as by cerebro-spinal fluid, while in the adult it does not reach lower than the first lumbar vertebra, where it terminates as a slender thread of gray matter. The spinal cord is a flattened cylinder, with a deep longitudinal furrow or fissure on both the anterior and the posterior aspects. These fissures divide the cord into symmetrical halves, which are united in the middle line throughout their whole length by a transverse band of nervous substance known as the commissure. In transverse section the cord is seen to consist of white and gray matter, of which the white lies externally, and constitutes the greater part. The gray matter is arranged somewhat in the shape of a crescent in each half of the cord, the two crescents being united near their middle by gray matter which passes

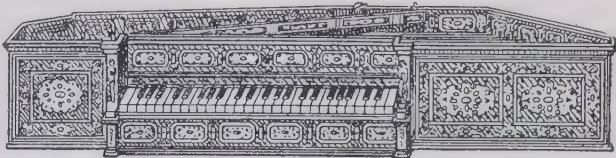
across the commissure. Both the white and the gray matter contain a supporting tissue known as neuroglia, which consists of elastic fibres and nucleated cells. The nerve cells are large, and stellate or multipolar, possessing many processes, which break up like the branches of a tree into fine nerve networks. The spinal cord is supplied with a large number of blood-vessels, and the blood-vessels and ganglion cells are surrounded by lymph spaces. The cord is enveloped in three membranes—the dura mater, the arachnoid membrane, and the pia mater—which are composed of fibrous connective tissue and endothelium.

The white medullated fibres which join the anterior pyramids of the medulla oblongata decussate almost entirely before entering the spinal cord, and it is owing to this that hemiplegic paralysis so often affects the side of the body opposite to that on which the lesion is. The nerve filaments of the white matter depend for their vitality upon the cells from which they spring, and should hemorrhage or other lesion destroy the cell in the cortex cerebri, the whole filament

motor fibres of the corresponding spinal nerve, and the muscles are also dependent upon these cells for their nutrition. Throughout the entire length of the spinal cord sensory fibres cross from one side to the other. A unilateral lesion of the spinal cord, therefore, produces motor paralysis on the same side as the lesion, along with sensory paralysis on the opposite side, the paralysis in each case being only below the seat of the lesion. The column of Goll, which lies in the posterior column close alongside the posterior median fissure, seems to convey the sensation of touch and the muscular sense.

All the nervous system is built

commonest bases being iron (in the ferrous and ferric states), alumina, magnesia, and chromic oxide, but zinc and manganese may also be present. As a rule the spinels form excellently developed octahedral crystals, belonging to the regular or isometric system, and their refractive index is high and their hardness usually great. The best known are precious spinel or balas ruby (pink and transparent), magnetite (black, metallic, and magnetic), chromite (dark brown or black); but zinc-spinel (franklinite), chrome-spinel (picotite), pleonaste, and hercynite also have a wide distribution.



Spinet.

up on the reflex plan. The spinal cord alone may carry out a reflex act, a sensation being received by the sensory ganglion cell of the cord, transmitted to the motor cell, and transformed into a motor impulse. But commonly part of the sensory impulse is sent up to the higher centres in the brain, which may then direct or control the resulting motor phenomena. In strychnine poisoning the subordinate spinal centres become hyperexcitable, and the slightest sensory stimuli lead to excessive discharge of energy, which is altogether beyond the control of the brain. Similarly, a lesion which cuts the communicating fibres between the brain and cord leaves the reflex centres uncontrolled, and the reflex movements which then follow—say, tickling of the sole—are consequently enormously exaggerated from want of the restraining influence of the higher centres. See also SCLEROSIS.

Spinazzola, tn., prov. Bari, Italy, 42 m. w. by s. of Bari; exports oil and fruit. Pop. (1901) 11,532.

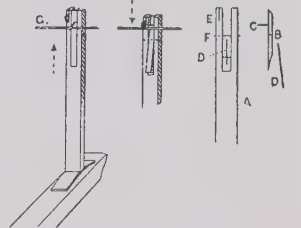
Spindle Tree. The common spindle tree (*Euonymus europaeus*) is a British hedgerow and woodland shrub, which bears glossy lanceolate leaves, and in late spring clusters of small greenish flowers, followed by fruits which become beautifully rose-coloured. The wood is very compact, and is used for making skewers. See EUONYMUS.

Spinel, a mineral group which contains a combination of a protoxide and a sesquioxide, the

Spinello, ARETINO (c. 1330-1410), Italian painter, born at Arezzo. He was a disciple of Giotto, and is known for his painting of frescoes, only a few of which have been preserved. His most famous are the *Fall of the Rebel Angels* and those executed for the sacristy of the church of San Miniato (Florence), with others at Pisa, Siena, and Arezzo.

Spines, in botany. See THORN.

Spinet, a keyed musical instrument much in use from 1600 to 1760. It derived its name from the spines or crowquills which, attached to levers called jacks, plucked the string and produced the tone. In England it was



Interior Mechanism of Spinet.
A, Jack; B, tongue; C, quill; D, bristle spring; E, cloth damper; F, pivot; G, wire.

specially popular in the reign of Elizabeth, its other name being virginal. In 1611 there appeared *Parthenia, the First Musicke that ever was printed for the Virginnalls*. The composers were William Byrd, Dr. John Bull, and Orlando Gibbons.



Spindle Tree.

1, Flower; 2, section; 3, fruit; 4, seed.

undergoes speedy degeneration. Should the filament be severed at any point, the portion situated distally from the cell degenerates in the same way. Destruction of the ganglionic cells of the cord is followed by degeneration of the

Spinifex, or PORCUPINE GRASS, an Australian grass (*Triodia irritans*), which covers large areas in that continent. Its narrow leaves are coarse and hard, and land covered with the grass is not easy to traverse.

Spinning. See COTTON (*Manufacture*), WOOLLEN TEXTILES, SILK, YARNS.

Spinola, AMBROSIO, MARQUIS OF (1571-1630), general, in the service of Spain, born at Genoa. He served under Mendoza in the Netherlands, was made commander-in-chief to cope with Maurice of Nassau (1604), when he took Ostend after a three years' siege; raised the siege of Ghent (1605), concluding a twelve years' truce (1609). In 1620 he conquered part of the Palatinate for the emperor; and returning (1621) to the Netherlands, took Breda (1625). See *Life*, in French, by Siret (1851).

Spinoza, BARUCH or BENEDICTUS DE (1632-77), Cartesian philosopher, was born at Amsterdam, and belonged to a Jewish family, but was later excommunicated on account of his heretical views. His life was entirely uneventful. His livelihood was earned by grinding lenses, his leisure devoted to philosophy. The works published by Spinoza in his lifetime—an exposition of Descartes's philosophy and (anonymously) the *Tractatus Theologico-Politicus* (1670)—are of less importance than those published after his death—his masterpiece, the *Ethica*, which is really a metaphysics as well; the short, unfinished treatise *De Intellectus Emendatione*; and the *Tractatus Politicus*. His system is essentially a development of Cartesianism, the most conspicuous feature of which is the fundamental dualism between thinking and extended substance. The *res cogitans* and the *res extensa*, alike in being substances, are so totally diverse in nature otherwise that the problem of their relation to each other could only be solved by subordinating them both to God as the infinite and only self-subsistent substance. Thinking and extension are for Spinoza not two substances of different nature, but only two diverse attributes of one and the same substance. They no longer have to be brought together by divine agency, for they are themselves already attributes of God—the infinite as He is also the only substance. The dualism of Descartes is thus transformed into a pantheistic monism, and this pantheism is worked out by Spinoza in terms of the three related conceptions of substance, attribute, and mode. His method of exposition and proof is an imitation of geometry, then the

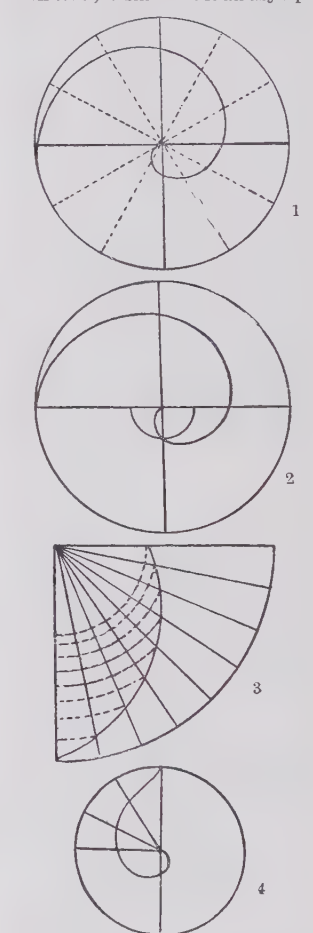
ideal of scientific demonstration, and starts with definitions and axioms, from which a series of propositions is then deduced. In the original definitions the main features of the system are virtually involved and assumed. God, the infinite substance, has, according to Spinoza, an infinity of attributes, but all finite things known to us belong to the two attributes of thought and extension. And since it is the same substance that is expressed in both these attributes, there is a thoroughgoing parallelism between the modes of thought and the modes of extension. The difficulties of Spinoza's doctrine in regard to the attributes were already seen in his own day by his acute critic and correspondent Tschirnhausen. The leading idea of the ethical part of Spinoza's great work is that in becoming conscious of the unity of all things in God we rise above the bondage of the passions and desires which belong to our finitude. His political doctrine owes much to the English philosopher Hobbes. The standard edition is that of Van Vloten and Land (1882). There are translations of the *Works* by Elwes (1884), and of the *Ethica* and *De Intell. Emend.* by Hale White (1883), expositions by Caird (1888), Martineau (1882), Pollock (1880), Joachim, and of his ethico-political doctrine by Duff (1903).

Spinthariscopes, an instrument contrived by Sir William Crookes in 1903 to show the luminous effects due to radium. It consists of a short brass tube closed at one end by a convex lens, and at the other by a zinc sulphide screen, with a small piece of radium salt placed close in front of it. An observer, looking at the screen through the lens, sees it lit up by dazzling scintillations, each of which marks the impact of an 'alpha particle,' hurled from the disintegrating radium. The flashes of light are held by Becquerel to be occasioned by actual cleavage of the crystals composing the screen; but R. W. Wood has obtained from later experiments some data which, though not conclusive, make it probable that this is not the actual process in operation.

Spiræa, a genus of herbs and shrubs belonging to the order Rosaceæ. They include the meadow-sweets of British hedges and ditches, and a large number of beautiful cultivated plants.

Spiral, a curve which winds round a centre or pole, while continuously approaching or receding from it. The following are the best-known spirals. (1) $r = a\theta$, spiral of Archimedes; (2) $r\theta = a$, hyperbolic or reciprocal spiral; (3) $r^2\theta = a^2$, lituus; (4) $r = ae^{m\theta}$,

equiangular or logarithmic spiral. In all these curves r is the radius vector, θ the angle it has described, a and m constants. These curves may be traced by finding the values of r for given values of θ , and plotting by polar coordinates the points so obtained. There are an infinite number of convolutions about the pole in each case; $r \sin \theta = a$ is an asymptote to (2), the initial line is an asymptote to (3), while in (4) as the angle increases in arithmetical progression, the radius vector increases in geometrical progression.



Forms of Spiral.

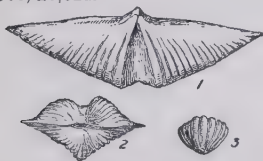
1. Spiral of Archimedes. 2. Lituus spiral. 3. Logarithmic spiral. 4. Hyperbolic spiral.

tote to (2), the initial line is an asymptote to (3), while in (4) as the angle increases in arithmetical progression, the radius vector increases in geometrical progression.

Spiranthes, a genus of terrestrial orchids, bearing flowers in spikes. They should be cultivated in pots of fibrous loam and peat, and should never have stagnant water about the roots.

Spire, an elongated pyramidal roof over a tower. It is a very important feature in Gothic churches, especially in England. Spires are usually of stone, but are formed also of wood and covered with slate or lead. In the Norman period corner turrets were commonly terminated with a sort of spire, the form on plan being the same as the turret itself, either round or square, and rising direct from the top of the tower without any parapet, as at St. Peter's at Oxford, or St. Stephen's at Caen. Later the spire proper, being a much longer pyramid, was octagonal, on a square tower, the corners being filled in, as it were, with angular pieces, when it was termed a broach. In later styles the parapet is well marked and ornamented with pinnacles and flying buttresses, as at Lichfield; while the spire itself is often perforated with openings, either simply moulded or having perpendicular jambs, covered with small gables and sometimes filled in with regular tracery. The spire is also ornamented with moulded or ornamental bands, as at Salisbury, while the angles are sometimes enriched with beads and sometimes with crockets. In Germany the later spires are entirely composed of tracery, as at Freiburg, Vienna, Cologne.

Spires (Ger. *Speyer*), tn., prov. Palatinate, Bavaria, on the Rhine, 21 m. by rail s. of Worms. There are remains of town walls, of an old palace, and of a subterranean bath. The cathedral was built in 1030, and contains the tombs of eight German emperors and some of their consorts. The Diet of the empire was frequently held here, and Spires was the seat of the imperial tribunal from 1513 to 1689. The town was taken and almost destroyed by the French in 1689, and again in 1794. Pop. (1900) 20,921.



Spirifers.

1. *S. Sowerbyi*. 2. *S. Sheppardi*. 3. *S. costalis*.

Spirifer, a fossil brachiopod. The shell is usually marked externally with radiating furrows, and the ventral valve has often in addition a well-marked mesial groove, to which a ridge corresponds on the dorsal valve. The opening for the peduncle is found only on the dorsal valve. In the interior there are two large spirally coiled supports for the arms. In shape the species vary greatly,

some being oblong, others very broad from side to side and short from front to back. The number of fossil forms, especially in the Silurian, Devonian, and Carboniferous formations, is very large.

Spirit. Originally there existed no distinction between spirit and soul or mind, because the only distinction that appeals to the primitive mind is the broad one between the outward and visible body and the inward or animating principle. Moreover, this latter principle is conceived in materialistic fashion, and is very usually identified with the breath. Even for philosophical reflection the true distinction between the material and the immaterial is not easily seized, and the early Greek philosophers were not much in advance of primitive thought in that respect. But when at last the immaterial nature of the soul was recognized, the notion of spirit still continued to play an important part in physiological theory (e.g. with Aristotle and the peripatetics), and spirit was regarded as a sort of connecting link between soul and body—a view which survives as late as Descartes's doctrine of 'animal spirits.' When materialism revived, as it speedily did, this ambiguous position of spirit made the notion peculiarly available, and in the Stoic philosophy it was widely extended to signify the principle which, all pervasive yet material, animates the whole world, as in the particular form of the human soul it animates the human body. In the religious notion of spirit as developed in the Old and New Testaments the central element comes to be that of divine or supernatural agency operative in the life of man. Hence spirit, though it may still be conceived in materialistic fashion, takes the highest place as the presence of the divine in man. Both the materialistic or physiological and the religious notion of spirit have now ceased to possess any psychological significance—the former because it has disappeared before a truer physiology, the latter because it is a religious notion with which a purely scientific psychology has no concern one way or the other. Consequently in philosophy the term spirit has now no special meaning distinct from mind or soul.

Spirit. See ALCOHOL, DISTILLATION, METHYLATED SPIRIT, PROOF SPIRIT, RECTIFIED SPIRIT.

Spirit, HOLY. See HOLY SPIRIT.

Spirit-fresco. See MURAL DECORATION.

Spirit-level. See LEVEL.

Spiritualism, or SPIRITISM, is, according to F. W. H. Myers, its protagonist, 'a religion, philosophy, or mode of thinking based

on the belief that the spirits of the dead communicate with living men' (*Human Personality, and its Survival of Bodily Death*, 1903). In 1,400 pages, embodying 16 vols. of *Proceedings* and 9 of the *Journal of the Psychical Research Society* (established 1882), *Phantasms of the Living* (by Gurney, 1886), and the results of thirty years' personal study and experience, he sets forth what he calls 'a partial presentment' of the subject. 'We have shown,' he claims, 'that amid much deception and self-deception, fraud, and illusion, veritable manifestations do reach us from beyond the grave.' In 'human faculty working in independence of material law'—e.g. telepathy, teleesthesia—and in the 'subliminal self,' he sees proof of 'a hidden world within us, and that this hidden world has revealed to us an invisible world without. Alfred Russel Wallace writes (*Miracles and Modern Spiritualism*, 1896), 'The facts..... compelled me to accept them as facts long before I could accept the spiritual explanation of them.' *Spiritualism* (E. Wake Cook and Frank Podmore, Pro and Con Series, 1903) contains a bibliography. As to the 'facts,' Sir William Crookes attests (*Researches in Spiritual Phenomena*, 1874) what he saw—'in my own house, in the light, and with only private friends present besides the medium,' who was Miss Florence Cook (Mrs. Elgie Corner). Florence Marryat describes in *There is no Death* (1891) the departure of the spirit Katie King, and is supplemented by Sir William Crookes. The phenomena vouched for by Sir William are 'percussive sounds, alterations of the weight of bodies, the rising of heavy bodies in the air without contact by any one, the levitation of human beings, luminous appearances, hands which lift small bodies yet are not the hands of any one present, direct writing by a luminous hand or by the pencil alone, phantom forms and faces.' Remarkable results in direct writing are recorded by Baron Gildenstein in *La Réalité des Esprits* (1857). Imperviousness to fire is established in the case of D. D. Home, the most famous medium known. Performances on musical instruments by invisible agents are also vouched for. The mental phenomena include precognition and retro-cognition of events, automatic writing (see Stainton Moses and W. Stead), clairvoyance, and clairaudience (*The Spirit World*, by Marryat, 1894), impersonation or obsession, speaking with tongues (e.g. Miss Edmonds), trance-speaking (Mrs. Piper), reported on by Dr. Hodgson, and especially

Andrew Jackson Davis, who thus dictated *Nature's Divine Revelation* (1847), and the discovery of the planet Neptune. In A. R. Wallace's *Defence of Spiritualism* (1875) will be found the names of many men of mark convinced of the genuineness of these physical and mental phenomena, though not all adopting the spirit hypothesis; and the chapters 'From Mesmerism to Spiritualism' in his recent autobiography should be consulted. A notable conversion was that of Dr. George Sexton, for fifteen years a sceptic, and at one time (1865) secularist coadjutor with Bradlaugh. (See his *God and Immortality*, 1874.) The author of *The Dangers of Spiritualism* (1901) bases a solemn and startling warning to the uninitiated, not on incredulity, but

The spiritualism of France, influenced by Allan Kardec—i.e. Hippolyte Denizard Rivail—teaching reincarnation, joins hands with the ancient East (see Jaccoliot's *Occult Science in India*, 1884), which is itself rivalled in eagerness by the youngest West, where in the United States spiritualists are to be counted by thousands. See, besides the works alluded to, *Varieties of Religious Experience* (by Professor W. James), lecture iii. 'Reality of the Unseen'; *Revue des Etudes Psychiques*, article by Dr. Venzano on 'Eusapia Paladino'; and *Shadow Land*, by D'Espérance.

Spitalfields, dist., London, 1 m. E.N.E. of St. Paul's; silk-weaving was introduced by Huguenots in 17th century, but is now practically extinct.



Spitzbergen.

on 'the danger of ignoring the action on us of an unseen spiritual universe,' and of blindly trusting intelligences who cannot be identified. This warning is reinforced from such different sources as Canon Wilberforce (*Address to Church Congress*, 1881), Professor W. F. Barrett (*Light*, May 2 and 9, 1896), and by Swedenborg himself, who cautioned his followers against substituting the dicta of spirits for the guidance of the Word of God (*Modern Spiritualism*, by R. L. Tafel, 1874). Mr. H. Croft Hiller (*Meta-Christianity*, 1903), in an attempt to construct a philosophy of spiritualism, also admits the practical impossibility of identifying spirits, so that St. Paul's warning to 'try the spirits' seems much needed. *Modern Spiritualism: a History and a Criticism* (Podmore, 1902) treats the subject somewhat sceptically.

Spithead, roadstead, English Channel, between the N.E. of Isle of Wight and Portsmouth.

Spithead, BATTLE OF, fought in 1545, between the English fleet and French fleet. The latter was kept at bay, and finally driven off.

Spitz. See POMERANIAN DOG.

Spitzbergen, a group of Arctic islands between Greenland and Novaya Zemlya, some 400 m. N. of Norway. They include W. Spitzbergen (15,260 sq. m.), North-East Land (4,040 sq. m.), Edge I., Barents I., Prince Charles Foreland, and many smaller ones. The interior is covered with a thick ice sheet, through which project peaks, some of which are 2,000 ft. high, and one, Hornsund in W. Spitzbergen, 4,560 ft. There are magnificent glaciers on the east of North-East Land; but the Gulf Stream sweeps the western side and

makes it warmer. Seals and walrus are found on the coasts, and sea-fowl—e.g. eider duck—breed on the islands. Spitzbergen was discovered in 1596 by Barents. In the 16th and 17th centuries Russian whalers almost exterminated the whales, and greatly diminished the seals in number. Many North Polar expeditions have started from these islands. See Scoresby's *Account of the Arctic Regions* (1820); Conway's *First Crossing of Spitzbergen* (1897), and *With Ski and Sledge over Arctic Glaciers* (1898); and *No Man's Land* (1906).

Splay, to widen out like the wing walls of a bridge.

Spleen, in anatomy, a small organ, about five inches long, lying high on the left side of the abdomen, near the upper end of the stomach, and partly behind it and the intestine. It is of soft, pulpy tissue, in a meshwork of fibrous and elastic substance, and is surrounded by an elastic capsule. It changes greatly in size, by the expansion and contraction of its muscular fibres, and according to the amount of blood which distends it. It tends to become distended a few hours after a meal. In the spleen the leucocytes, or white blood corpuscles, multiply by division. Also many red corpuscles are broken down there. The spleen may suffer from acute inflammation and hypertrophy. It is also occasionally the seat of tubercular disease, cancer, and syphilitic changes. Splenic fever is one name for malignant pustule.

Spleenwort, any fern of the order Asplenaceæ or the type genus *Asplenium*. Most of the species are tropical; the distinguishing characteristics are the long sori, or spore cases, at the back of the fronds, and covered by a protective membrane (the *indusium*).

Splenetic Fever. See ANTHRAX. **Splint**, or SPLENT. See HORSE—Diseases.

Splints, surgical appliances designed to secure rest and immobility of damaged parts. Thin strips of wood, millboard, leather, tin, zinc, lead, and iron are employed; and for emergency work temporary splints may be improvised from walking sticks, umbrellas, guns, broomsticks, or fire-irons. Bandages impregnated with starch, plaster of Paris, or other stiffening agents are light, and form excellent means of fixation in certain cases. Some injuries, however, require treatment in which passive movement of a joint plays a part. In such a case a hinged splint may be desirable. Splints must be well padded, and so adjusted as to cause no injurious effects through pressure.

Splügen, Alpine pass (6,946 ft.), traversed by a good carriage road from Coire (Swiss canton of Grisons) in the Rhine valley to Chiavenna in Italy. This pass was crossed in the winter of 1800 by the French army under Macdonald.

Spohr, LUDWIG (1784-1859), German violin virtuoso and musical composer, born at Brunswick. He was musical director successively at Gotha (1805), Vienna (1813), Frankfurt-on-Main (1817-19), and Kassel (1822-57). He was the first to use the conductor's baton in Britain (London Philharmonic, 1820). Though he seldom deviated from traditional principles in his own compositions, he was among the first to recognize and proclaim the genius of Wagner. His works are in nearly every branch of music; he was also the author of a celebrated *Violin School*. See his *Autobiography* (Eng. ed. 1865), and *Life*, in German, by Schletterer (1881).

Spoil Five. See GAMBLING.

Spokane, city, Washington, U.S.A., co. seat of Spokane co., at the falls of Spokane R., 230 m. E. of Seattle. It manufactures flour and lumber. Pop. (1900) 36,848.

Spoleto, tn., prov. Perugia, Italy, 59 m. by rail N.N.E. of Rome. It is the seat of an archbishop, and produces truffles. About 570 it became the seat of a duchy, which lasted till the 12th century. Pop. (1901) 24,648.

Spondee, in prosody, a metrical foot consisting of two long syllables, as *fāto*. It is metrically equivalent to a dactyl or an anapaest, and is therefore found in all dactylic and anapaestic metres; it is also used under certain restrictions in trochaic and iambic rhythms.

Spondias, a genus of tropical trees belonging to the order Anacardiaceae. They bear small flowers, followed by fleshy drupes. The principal species are *S. lutea*, the so-called golden apple or Jamaica plum, and *S. dulcis*, the sweet Otaheite apple.

Sponges, or PORIFERA, a group of animals, of which the common bath sponge is a highly specialized form. A more typical form is the little purse sponge (*Grantia compressa*), common between tide marks on British shores. It consists of a little sac attached by one end to a rock surface, while the other end hangs down freely in the water. This free end bears an orifice of considerable size, called the osculum. The currents of sea-water enter the central cavity of the body by minute pores scattered over the surface of the sac, and bring with them food and oxygen, and sweep outwards at the osculum, bearing with them not only the undigested residue

of the food, but also carbon dioxide and other waste products, as well as at certain seasons the reproductive elements. Between tide-marks, but in slightly deeper water, there may be found a smaller sponge, *Sycon ciliatum*, readily distinguished by its silky appearance. This, as a lens will show, is due to the presence of numerous spicules or needles of lime on the surface. Similar spicules also form a crown round the osculum. Centrally there is a cavity, which communicates with radial chambers arranged around it in the wall of the sponge. These radial chambers also communicate with the exterior by pores, and are lined by collar cells (choanocytes), which are cells furnished with a frill or collar of protoplasm, and with a long motile thread or flagellum. The surface of the sponge is covered with flattened cells, while similar cells also line the central cavity. Between these two layers of cells there is a third less distinct layer, the mesogloea, while supporting the radial chambers are little spicules of lime. In other sponges the radial chambers become much folded and branched, or small spherical chambers, opening into a more or less complicated system of canals, are present, forming what is known as the Rhagon type. In the more complicated types it is usual for the central cavity of *Sycon* to be either obliterated or to become indistinguishable from the system of canals. It is this which gives to many common sponges their uniformly spongy structure.

Both *Grantia* and *Sycon* have a skeleton made of spicules of lime; both therefore belong to the group of calcareous sponges. In the same group, which includes what are apparently the most primitive of the sponges, we find, though rarely, a type of sponge structure which is simpler even than that of *Sycon*. In *Ascetia primordialis*, for example, the body consists of a simple sac, as in *Grantia* or *Sycon*; but the wall is perforated by large pores, and consists of an external layer of cells separated by a middle layer from an inner layer, which is not folded into chambers, but is a simple investment, a lining of the central cavity. Such a sponge differs little from the simple larval form called the gastrula, which appears in the development of many different kinds of organisms, and which is, as it were, permanent in the Coelentera (sea-anemones, sea-firs, and so on). To Haeckel the occurrence of such forms as *Ascetia* suggested that sponges and coelenterates are derived from a common gastrula-like ancestor.

His conclusions were, however, based, in the first instance, on a study of the calcareous sponges, which are an isolated group, displaying an apparent greater simplicity of structure than other sponges, the majority of which in adult life display no obvious relation to the gastrula. Further, even in the calcareous sponges there is some difficulty in homologizing the parts of the sponge with the parts of a gastrula or of a coelenterate.

Sponges as a whole may be divided into two sections—the calcareous sponges, in which the skeleton always consists of lime, and the other in which limy spicules are always absent. The former, as was first pointed out by Haeckel, show all gradations from the simplest known type of canal system to some of the most complex. But the more complex types occur, as it would seem independently, in the non-calcareous sponges, affording a remarkable example of parallelism in development. In this case the parallelism is to be explained, according to Professor Sollas, as the result of similar physiological needs. These sponges are widely distributed, but are commonest in shallow water, and rarely extend downwards below 150 fathoms. The majority of the non-calcareous sponges either contain silica or are nearly allied (horny sponges) to siliceous forms. Of the siliceous forms the simplest are those in which the spicules of flint are six-rayed (Hexactinellida). These appear very early as fossils, and their canal system is generally of a simple syconate type. To this section belong the beautiful Venus's flower-basket (*Euplectella*) and the curious glass-rope sponge (*Hyalonema*). Generally speaking, the members of this section inhabit deep water (usually over 150 fathoms), and this fact, in combination with the simple structure of the soft parts and their elaborately beautiful skeleton, is believed by Vosmaer to prove that the original sponges were deep-sea animals, and possessed a better developed skeleton than their descendants the existing specialized sponges which occur in shallower water. Owing to their deep-sea habitat the hexactinellid sponges were little known, except as regards external characters, until the dredgings carried on during the *Challenger* expedition (1872-6) produced a large number of specimens, which were worked out by Professor Schultze.

The hexactinellid sponges form a well-defined group; but the classification of the remaining siliceous sponges is a matter of considerable difficulty. Among them we find sponges whose skele-

ton consists at least chiefly of uniaxial spicules, others in which it consists of horn, and others in which it consists of quadriaxial spicules. In consequence many classifications recognize three subdivisions: (1) the monaxonid sponges, (2) the horny sponges, and (3) the tetractinellid sponges. But recent work tends to show that the three groups are interrelated at different points. To the monaxonid division belong very many of the common British sponges—the boring *Cliona*, common in oyster shells, and constituting an active agent in their disintegration; the orange-yellow *Suberites*, which lives in symbiosis with a hermit-crab; the mermaid's glove (*Chalina*), a common branched sponge; the extraordinarily abundant crumb-of-bread sponge (*Halichondria*), which forms a thick crust over many objects between tide-marks; and the curious fresh-water sponge (*Spongilla*), with its green colouring matter. The monaxonids mostly inhabit shallow water (under 50 fathoms); the siliceous skeleton is never complex, and shows a tendency to become reduced. Of the horny sponges (*Ceratos*) the most important are the bath sponges (*Euspongia* and *Hippospongia*), in which the horny fibres are exceptionally soft, fine, and elastic. The 'sponge' of commerce is merely the skeleton after the removal of the soft parts by maceration. The bath sponges are widely distributed in the eastern half of the Mediterranean, where they occur at all depths down to 200 fathoms, and are obtained by harpooning, diving, or dredging. The fishing is only profitable in specially favourable localities, such as the eastern shore of the Adriatic, the coast of Greece, Asia Minor, and parts of the African coast. Bath sponges occur also in the Red Sea, off the coast of Australia, round the Bahamas, and elsewhere. Efforts have been made in the Adriatic and off the Florida coast to cultivate sponges artificially by a process of planting-out of cuttings. Owing to the slowness of growth, the experiments have hitherto proved to be of no economic value. Among the tetractinellid sponges are included some of the most highly specialized genera. They are commonest at depths of from 50 to 200 fathoms. Included in this subdivision are the stony sponges (*Lithistids*), which usually live in depths exceeding 100 fathoms, and present a superficial resemblance to the hexactinellids.

Not infrequently sponges form associations with other animals, ranging from the apparently chance connections formed—e.g. by *Halichondria* and certain

spider-crabs—to an apparently definite symbiosis, such as occurs in the glass-rope sponge, which seems always to have a coelenterate colony (*Palythoa*) on its long 'rope' of spicules. As sponges are usually inedible, some of the associations with Crustacea at least can no doubt be explained as protective to the latter. Sponges are abundantly represented as fossils in all rocks. The vast majority of living forms are marines, but a few (e.g. *Spongilla*) inhabit fresh water.

In *Zoological Articles*, by Professor Ray Lankester and others (1891), Professor Sollas gives a large amount of information. The *Challenger* volumes on sponges, especially vol. xx. (*Report on Monaxonida*, by Ridley and Dendy), vol. xxv. (*Report on Tetractinellida*, by W. J. Sollas), and vol. xxi. (*Report on Hexactinellida*, by F. G. Schultze), give very full accounts of certain groups of sponges. An article on 'The Position of Sponges in the Animal Kingdom,' by G. A. Minchin, in *Science Progress* (vol. i, 1897), gives a historical account of the views which have been held on the position of sponges. For British sponges, see Bowerbank's *Monograph of British Spongiadae* (vols. i-iv., 1864-82); but its classification and nomenclature have now been to a large extent superseded. The *Horny Sponges* are the subject of a monograph by Von Lendenfeld, published by the Ray Society (1887).

Sponsors, the godparents of infants baptized into the Christian church. They become sureties for the child, and promise in its name to renounce the devil and all his works, believe in God, and serve Him; and they undertake that the child shall be brought up in the Christian religion. In the early Christian church the parents of the child were allowed to be its godparents, but this was formally prohibited by the Council of Mainz in 813. For a long time there was no rule as to the necessary or permissible number of godparents; but the Council of Trent, in the middle of the 16th century, determined that there should be only one, or at the most two, not being of the same sex. In the Church of England the rubric of the Prayer Book directs that there shall be for every male child two godfathers and one godmother, and for every female one godfather and two godmothers. The third rubric at the end of the Catechism directs that every one shall have a godfather or a godmother as a witness of their confirmation. The Lutheran churches retained godparents at the reformation, but the other reformed churches imposed the duty on the parents.

Spontaneous Generation.

Although there is no proof that spontaneous generation is ever known to have occurred within the experience of man, yet very many biologists believe that life originated upon this globe at some time by a spontaneous process. If it occurred once, why may it not occur again? Further, no organism has ever been known to arise except from previously existing organisms; but this may be because the means used to destroy already existing organisms in the experimental solution are also destructive of the unstable compounds in process of becoming organized. The first difficulty is met in various ways. Some biologists say that the conditions present at the time when life arose have never been repeated; others point to the fact that the substance becoming organized, as it were, would require to struggle against the well-adapted organisms already existing, which have been fitted to survive by ages of struggle. As regards the second point, no one as yet has suggested any line of investigation likely to lead to a means of differentiating between existing micro-organisms and those in process of originating. Nevertheless, at least one investigator, Dr. Bastian, believes that he has proved that unicellular organisms can and do arise *de novo*. In 1905 Mr. J. Butler Burke's experiments at Cambridge, and his pronouncement that the action of radium on a gelatin medium produced bodies which appeared to have many of the characteristics of living matter, raised keen interest; but further experiments by others with non-radiferous chloride of barium gave rise to the same bodies: the effects are probably purely chemical. See Burke's *The Origin of Life* (1906), and *Nature* (1905-6). See also Huxley's Presidential Address to the British Association (1870), Tyndall's article in the *Nineteenth Century* (1878); Spencer's *Principles of Biology* (1864-7), Haeckel's *Natural History of Creation* (ed. 1892), Verworn's *General Physiology* (trans. 1899), and Bastian's *Studies in Heterogenesis* (1904). See also BIOLOGY.

Spontini, GASPARO LUIGI PACIFICO (1774-1851), Italian operatic composer, born at Majolati, near Jesi. In 1803 he went to Paris, where he chiefly resided until 1820, when he was appointed musical director to Frederick William III. of Prussia, a position he held till 1842. His operas were once very popular, but are now almost forgotten. The most celebrated were *Milton* (1804), *La Vestale* (1807), *Ferdinand Cortez* (1809), and *Olympia* (1819). See *Life* in German by Robert (1883).



Species of Sponges.

1. *Spongilla fluviatilis* (freshwater sponge). 2. *S. lacustris* (freshwater sponge). 3. *Thrinacophora funiformis*. 4. *Dendropsis bidentifera*.
5. *Euperopsis Challengeri*. 6. *Siphonochalina annulata*. 7. *Hyalonema Sieboldii*. 8. *Euplectella aspergillum*. 9. *Semperella Schultzei*.
10. *Sclerothamus clausii*. 11. *Desmacidon grandis*. 12. *Farræa ocea*. 13. *Periphragella elise*. 14. *Reniera aqueductus*. 15. *Echinoclathria Carteri*. 16. *Phakellia flabellata*. 17. *P. ventilabrum*. 18. *Cinachyra barbata*. 19. *Isodictya palmata*. 20. Diagram showing circulation of water in living sponge.

Spoonbill (*Platalea leucorodia*), a bird belonging to the same family as the ibis, which formerly nested in Suffolk, and is now an occasional visitor to



Spoonbill.

Britain. It receives its common name from the shape of the large bill, which is broad and depressed, and has a spatulate extremity. It feeds in shallow water, on fish, frogs, molluscs, and crustaceans. The bird has a length of about thirty-six inches, and is white in colour, with some yellow on the side of the neck and on the crest. The bill is black and yellow, and the legs and feet are black. There is also a naked yellow patch on the throat. The common spoonbill ranges over Central and S. Europe, N. Africa, and much of Asia. Other species also occur throughout the warmer parts of the Old World. The spoonbill of America belongs to another genus, *Ajaja*, including the roseate spoonbill (*A. rosea*). The shoveller duck was formerly called spoonbill, and conversely the spoonbill was called shoveller.

Sporades Islands. See GREEK ARCHIPELAGO.

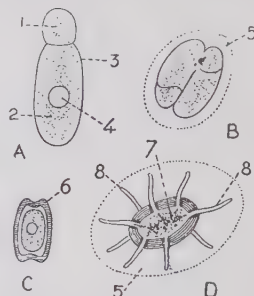
Sporadic Disease, in medicine, an infective disease occurring occasionally in a district, but not present as an epidemic (i.e. sudden and widespread) or endemic (more or less constantly present).

Spore, a specialized reproductive cell, capable of giving rise to a new vegetable organism. This method of multiplication may be anticipated in single-celled bacteria, algae, and fungi, where the vegetative body divides, each portion developing into an independent plant. In higher algae and fungi spores are formed in special organs, or sporangia. Propagation by spores may be asexual or sexual. The simplest mode of the latter is by the union of two similarly-formed sexual cells or gametes from which results a zygospore or zygote. In some of the higher cryptogams the sexual cells are

differentiated into microspores or male cells and macrospores or female cells. When the spores are of one kind—i.e. undifferentiated—the plants are said to be homosporous, as the true ferns, horsetails, and club mosses; the water-ferns and Selaginaceae are heterosporous. Spore-cases also receive special names, as microsporangium, macrosporangium; the part on which they are borne is the sporophyll—a frond, as in ferns, or the apex of a shoot, sometimes known as the flower-cone, in the horsetails.

Spörer, FRIEDRICH WILHELM GUSTAV (1822-95), German astronomer, was born at Berlin, and began to observe sun-spots at Anklam in 1860. He verified the equatorial acceleration of the sun's rotation, and established a relation between the mean latitude of spots and the course of the eleven-year cycle. He joined the German eclipse expedition to the E. Indies in 1868, was appointed observer in the astrophysical observatory at Potsdam

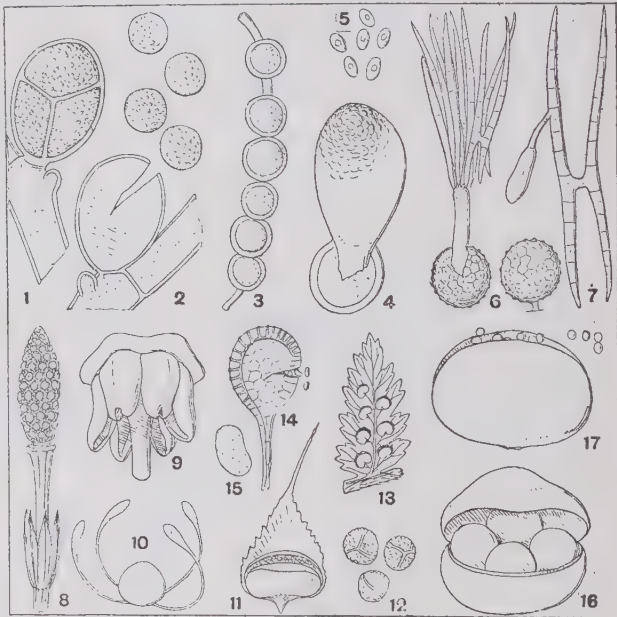
type. There are also a number of other small and obscure forms which occur in the muscle fibres or in the blood of vertebrates. Of the former the species of



Sporozoa.

A. Adult individual. B. Two individuals conjugating. C. A spore. D. Cyst containing spores. 1. Protomerite; 2. deutomerite; 3. cortex; 4. nucleus; 5. cyst; 6. capsule; 7. spores; 8. ducts.

Sarcocystis are examples. They are apparently harmless. The



Types of Spores.

1. Tetraspores of alga in sporangium. 2. Spores escaped. 3. Chlamydospores of fungus. 4. Do., germinating and bearing a sporangium. 5. Spores extruded from sporangium. 6. Teliospores, one germinating, bearing conidia. 7. Zygospore from two conidia conjoined. 8. Cone of horsetail. 9. One sporophyll with empty sporangia. 10. A spore. 11. Scale sporophyll and sporangium of club moss. 12. Three spores from same. 13. Frond of fern bearing sporangia in sorus. 14. One sporangium of do. 15. One spore. 16. Macrosporangium of Selaginella, containing four macrospores. 17. Microsporangium of do., containing microspores.

in 1874, and promoted to be chief observer (1882-94).

Sporozoa, a class of Protozoa. The larger members of the class occur as parasites in invertebrates, and of these Gregarina is a good

forms which occur in the blood include those which produce malaria and the related diseases in man, the tsetse-fly disease in cattle, and sleeping sickness in man.

Sporting Times, THE, a weekly newspaper devoted to sport, best known by its subtitle of *The Pink Un*, an allusion to the tint of paper on which it is printed. It was founded in 1865 by Dr. Shorthouse, who was assisted by Mr. John Corlett. Mr. Corlett purchased the property in 1874, and has since remained as editor and sole proprietor. Some of the staff of the *Sporting Times* use pen-names, which in sporting circles have long been household words. Mr. Corlett himself is styled 'The Master,' and others are 'The Dwarf o' Blood,' 'The Pitcher,' and 'Nathaniel Gubbins.' Almost wholly devoted to horse-racing, the *Sporting Times* has a parenthetical reputation for racy humour and anecdote.

Sports, BOOK OF, the proclamation made by James I. in 1618, that, after divine service on Sundays, 'no lawful recreation should be barred to his good people,' such sports being named as morris dances, dancing round the Maypole, archery, May games, vaulting, Whitsun-ales, running, leaping, and the like; but such pursuits as dramatic interludes, bear-baiting, bull-baiting, bowling [sic] were forbidden. This 'declaration' was called forth by the action of some of the Lancashire Puritans. The *Book of Sports* was ordered by the Long Parliament to be burned by the common hangman (1644). See Govett's *The King's Book of Sports* (1890).

Spottiswoode, ALICIA ANNE (LADY JOHN SCOTT) (1810-1900), Scottish song-writer and antiquarian, best remembered for her rendering, both in words and in music, of the modern version of *Annie Laurie*. Lady Scott was a repository of many old stories and traditions. See *Songs and Verses by Lady Jane Scott* (1904), with Memoir by Miss Margaret Warrender; Crockett's *Minstrelsy of the Merse* (1893); Sir George Douglas's *Diversions of a Country Gentleman* (1902).

Spottiswoode, JOHN (1565-1639), archbishop of St. Andrews, succeeded his father as minister of Calder in 1583. In 1601 he accompanied the Duke of Lennox on his embassy to France. He became archbishop of Glasgow in succession to James Beaton; and in 1615 was translated to St. Andrews. He crowned Charles I. at Holyrood, and in 1635 received the chancellorship of Scotland. As moderator of the General Assembly he promoted the establishment of Episcopacy in Scotland, and by his influence the obnoxious Five Articles of Perth (1618) were sanctioned. On the ascendancy of the Covenanters he was deposed and excommunicated, and was compelled to resign his

office of chancellor. He was buried in Westminster. His *History of the Church and State of Scotland* (1655) was reprinted, with a Life, by the Spottiswoode Society (1847-51). He also wrote *Refutatio Libelli de regimine ecclesie Scoticanæ* (1620).

Spottiswoode, WILLIAM (1825-83), English mathematician, was born in London, and succeeded to his father's business as Queen's printer in 1846, but remained a devoted student of mathematical and physical science. He published *Meditationes Analyticae* (1847), *The Polarization of Light* (1874), and *A Lecture on the Electrical Discharge* (1881).

Spottsylvania Court House, cap. of co. of same name, Virginia, U.S.A., 49 m. N.W. of Richmond; was the scene of several battles in the American civil war, and especially of the struggle between the Federals under Grant and the Confederates under Lee, May 10-12, 1864.

S.P.Q.R. (*Senatus Populusque Romanus*), the Senate and People of Rome.

Spragge, SIR EDWARD (? 1629-73), British admiral, was born in Ireland. He took part in the action off Lowestoft on June 8, 1665, and in the four days' fight off the N. Foreland (1666). He also served in the St. James fight of 1666. In the third Dutch war he was vice-admiral of the red at the battle of Sole Bay in 1672, and admiral of the blue in the three battles off Schooneveld. In the last of these he was drowned.

Sprain, or **STRAIN**. A sprain is due to laceration of, and effusion into and around, the fibrous tissues of a joint, and is usually produced by a violent twist or wrench. In certain cases, which are sometimes called 'sprain fractures,' small scales of bone are torn off with the ruptured ligament. Even slight sprains are accompanied by severe pain and by considerable swelling, partly from extravasation of blood into the surrounding tissues, and partly from inflammatory effusion into the joint. Permanent weakness and stiffness, or even ankylosis, may follow a neglected sprain. Immediately after the accident the injured part should be held under a cold tap for a few minutes. The limb should then be raised, wrapped thickly in cotton wool and tightly bandaged. In most cases a splint should be applied, and the limb ought to be raised to the greatest height consistent with the patient's comfort. When the acute symptoms have subsided, gentle passive movement should be employed, and a little later active movements of the joint may be made. As a rule, however, treatment of a sprain is not initiated until some

hours after the injury, and the pain may then be so intense as to necessitate the application of hot fomentations; but as these dilate the blood-vessels and tend to increase the effusion and swelling, they should be employed as little as possible. Inflammatory symptoms are best combated by cold applications, such as ice bags or evaporating lotions. As soon as the pain permits of it, elastic pressure should be applied to the joint by means of cotton wool and flannel bandages. At the same time gentle massage helps to dispel the swelling.

Sprat (*Clupea sprattus*), a fish of the herring family, abundant round the coasts of Britain. Young sprats are not very easily distinguished from young herring, and whitebait nearly always contains both. The sprat is usually from four to five inches long, and may be distinguished from the herring by having seven rays in its pelvic fin in place of nine, the edge of the belly narrow instead of blunt, and in bearing strong sharp spines on this region instead of weak ones like the herring. The scales are also proportionately larger. The eggs of the sprat are



Sprat.

pelagic or floating. The spawning period differs in different parts of the British area. Thus eggs are found at Plymouth from January to April, but at St. Andrews from April till July. The adults live in brackish water, from which they migrate to the open sea as they become ripe. Besides being used as food in London and elsewhere, sprats are sometimes sold for manure. They are also dried and salted, and put upon the market as 'kilkies'—i.e. sprats from the Baltic cured with spices—and as 'Norwegian anchovies.' In narrow waters, such as estuaries, sprats are chiefly taken in stov-nets, but seines and small-meshed drift-nets are also used.

Sprat, THOMAS (1635-1713), English poet, wit, and bishop, was born at Beaminster in Dorsetshire. He was at first known as a smart versifier and wit. At the restoration he developed into an ardent royalist, was ordained (1661), and in 1669 appointed canon, in 1683 dean of Westminster, and in 1684 bishop of Rochester. He assisted at the coronation of William and Mary. His most important books were *Observations on M. de Sorbier's Voyage into England* (1664) and *History of the Royal Society of London* (1667).

Spree, riv., Germany, rises in Saxony. In the neighbourhood of Berlin it forms a perfect network of arms and lakes, and falls into the Havel at Spandau. Length, 230 m. It is connected by several canals with the Oder.

Spengel, HERMANN JOHANN PHILIPP (1834–1906), German chemist and physicist, was born near Hanover, and came to England in 1859 to work at Oxford, afterwards in London. His name is principally connected with the Sprengel pump for obtaining high vacua by the fall of drops of mercury in a narrow tube, with the Sprengel tube for the accurate determination of specific gravity, and with the explosive properties of aromatic nitroderivatives, largely employed as safety explosives—e.g. melinite, lyddite.

Sprengel, KURT (1766–1833), German physician and botanist, born at Boldekow (Pomerania). He was appointed at Halle professor of medicine (1789), later of botany (1797) as well, retaining the chairs till his death. His works include *Geschichte der Arzneikunde* (1792–1803), *Antiquitates Botanicae* (1798), *Geschichte der Botanik* (1817–8), *Institutiones Medicae* (1809–16), *Flora Halensis tentamen novum* (1806, 1815, 1832), *Opuscula Academica* (1844), with Life by Rosenbaum.

Sprenger, ALOYS (1813–93), Austrian Orientalist, was born at Nassereit in Tyrol. In 1838 he was naturalized as a British subject, and after acting as principal of a Mohammedan college at Delhi, he became (1848) assistant resident at Lucknow. He left India in 1857, and became professor of Oriental languages at Bern (1858–81). His chief works are *Life and Doctrine of Mohammed* (1861–5), *The Ancient Geography of Arabia* (1875) and *Babylonia* (1886), all in German. He edited numerous editions of Persian and Arabic classics.

Sprenger, JACOB, German inquisitor, appointed (1484) by Pope Innocent VIII., joint author, with Heinrich Institor (Krämer), of *Malleus Maleficarum*, or *Hexenhammer* (1489; best edition, Lyons, 1669). He was a Dominican and professor of theology at Cologne. The book, valuable as an illustration of the ignorance, superstition, and cruelty of the middle ages, was long the standard authority of witch-finders.

Sprigg, SIR JOHN GORDON (1830), colonial statesman, was born in Ipswich, England, and went out to S. Africa in 1858, settled in Cape Town, and worked there as a journalist. He was elected to the House of Assembly in 1869, and later became colonial secretary and prime minister (1878–81). He ac-

cepted the portfolio of treasurer in May 1884, and in November 1886 again assumed the premiership. His tenure of office lasted until July 1890. He was again in the ministry of Cecil Rhodes as treasurer in May 1893, and when, in January 1896, Rhodes resigned the premiership in consequence of the Jameson Raid, Sprigg became prime minister for the third time. He was defeated at the general election of 1898, but was again in power in June 1900. Two years later he was created G.C.M.G. During the progress of the South African war (1899–1902) he was driven to rely upon his former opponents, the Afrikaner Bond. He appealed to the country in 1904, but lost his seat at E. London on February 11, and resigned a week later.

Spring is any underground supply of water which overflows at the surface without artificial aid. The requirements are (1) a porous surface rock, through which the surface water can filter; and (2) an impervious layer at greater depth, which arrests the downward progress of the water. Wherever these pervious and impervious layers crop out at the surface, water will flow out in a line of spring above the impervious rock, provided the strata dip upwards from the outcrop or lie horizontally. If the strata dip downwards, the water will not flow over the edge of the impervious stratum until the ground water level has risen above its margin—i.e. the spring is the visible overflow of a lake basin filled with porous rock, or at least with a porous layer. The rate of discharge of a spring varies according to the rainfall of the area of permeable rock at the surface through which the water must pass. The times of maximum and minimum discharge naturally occur after those of greatest and least rainfall. Some springs are intermittent, drying up for a season each year. Cases of permanent diminution of discharge are reported from certain areas where much water is pumped—e.g. in the London basin. If the water comes from sufficient depths it will be warm, and springs yielding waters of all temperatures up to the boiling-point are known—e.g. Matlock, 66° F.; Buxton, 82° F.; Bath, 117° F.; Vichy, 95° to 115° F.; Wiesbaden, 156° F. A special form of hot spring is the geyser. Mineral and hot springs give rise to many health resorts. Springs which contain little mineral matter yield soft water, in which soap can easily be dissolved; those with carbonates, or sulphates, or chlorides, give out hard water, in which soap curdles. We may group the mineral springs according to the nature of their

chief dissolved constituents:—(1.) Alkaline springs, with sodium carbonate, the natron of commerce, are common—e.g. in Hungary—and have a very acrid flavour. (2.) Saline springs, with common salt, such as the brine springs of the salt-yielding rocks—e.g. the Triassic in Cheshire—or the spa waters, at Cheltenham and Wiesbaden. Other saline springs contain sulphates of magnesium and sodium; such are the famous springs of Epsom, Kissingen, and Seidlitz. (3.) Sulphurous springs produce water with the smell of rotten eggs and charged with sulphuretted hydrogen, as may be experienced at Harrogate. (4.) Ferruginous or chalybeate springs containing the ochreous ferrous oxide, which has an inky flavour, are widely distributed—e.g. Buxton. (5.) Calcareous springs abound in limestone regions, and are utilized at Bath. When the water evaporates travertine is formed. (6.) Calcareous and other springs are often effervescent, especially in volcanic regions, owing to the presence of carbon dioxide—e.g. at Vichy. (7.) Siliceous springs, with silicic acid, are found in traces in many mineral springs—e.g. Wiesbaden—and in geysers—e.g. in Iceland.

Spring, the first season of the year, is astronomically defined to begin in the northern hemisphere about March 21, when the sun enters the sign of Aries—i.e. at the vernal equinox. It terminates at the summer solstice, about June 22, with the sun's attainment of his greatest northern declination. In the southern hemisphere spring extends from the northern autumnal equinox to the winter solstice.

Spring, TOM (1795–1851), English pugilist, champion of England in 1824; beat Jack Langan (77 rounds) on January 9, 1824, and again (76 rounds) in June 1824. Spring acquired the reputation of a straightforward, honest fighter.

Spring-balance. See BALANCE.

Springbok (*Gazella euchores*), a South African gazelle, with bold markings in white and dark brown on a yellowish ground. Down the middle of the back there runs a stripe of long white erectile hairs. The name is given on account of the habit of springing up into the air.

Springer. See SPANIELS.

Springfield. (1.) Town, cap. of Illinois, U.S.A., and co. seat of Sangamon co., 180 m. s.w. of Chicago, is an important railway centre. It has a fine state capitol and an arsenal. It has coal-mining, iron, lumber, and flour industries. Abraham Lincoln had his home here and is buried here. Pop. (1900) 34,159.

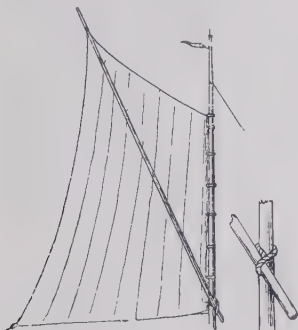
(2.) City, Massachusetts, U.S.A., co. seat of Hampden co., on Connecticut R., 85 m. w.s.w. of Boston. It manufactures paper, machinery, cottons, and firearms, and has a cathedral. Pop. (1900) 62,059. (3.) City, Missouri, U.S.A., co. seat of Greene co., 150 m. s.e. of Kansas City, with flour mills, machine shops, and woollen and cotton factories. Pop. (1900) 23,267. (4.) City, Ohio, U.S.A., co. seat of Clark co., 68 m. n.e. of Cincinnati. It produces machinery, hardware, and paper. Pop. (1900) 38,253.

Spring-gun, a weapon designed for the defence of houses and lands against trespassers and burglars (against the latter alone its use has been legalized since 1827), so placed and contrived as to be discharged by the action of the intruder. Rifles were thus used in connection with blockhouses and barbed-wire fences in the Boer war (1899-1902). Spring-guns are also used to destroy wild animals of the larger kind, such as bears and wolves.

Springs. See CARRIAGE-BUILDING.

Springtails. See COLLEMBOLA.

Sprit Sail, a fore-and-aft sail, bent to the mast at the weather leech, and having the after peak stretched by a spar or sprit, the foremost and lower end of which is hitched to the mast. In small boats the sprit end rests in a cord collar, attached to a cord ring round the mast, which may be pushed upwards to extend the sail, and which will remain fast with the angular pressure.



Sprit Sail.

Sprocket Wheel, a toothed wheel working in a chain. See CYCLES.

Spruce, a name given to the white spruce (*Picea alba*), the Norway spruce (*P. excelsa*), the black spruce (*P. nigra*), and certain other fir trees. They have short leaves, borne on drooping, plumelike branches. The spruces are distinguished from most other

firs by the fact of their cones falling off whole.



Common Wood Spurge.

1, involucre, with male and female flowers;
2, stamen (male flower).

Spruce Beer, a wholesome alcoholic beverage, prepared by boiling together sugar solutions and essence of spruce, cooling down, and fermenting with yeast. It is much used by the Canadians and inhabitants of timber regions.

Spur, an instrument with serrated edge or sharp spikes upon it, attached to the heels of a horseman, and used for the purpose of goading the horse to greater speed. Of late their use has greatly decreased even in the army. In chivalry the phrase 'winning his spurs' was equivalent to qualifying himself for receiving the honour of knighthood. A knight's spurs were of gold, a squire's of silver.

Spurge, a genus of plants belonging to the order Euphorbiaceæ. The common wood spurge (*Euphorbia amygdaloides*) is one of the most beautiful woodland plants of Britain, especially in autumn, when its shrubby stems and narrow egg-shaped leaves become coloured a beautiful red. In the spring also its beautiful yellowish leaves and flowers make it a conspicuous plant. The spurge was once commonly used in medicine. See also EUPHORBIA.

Spurge Laurel. See DAPHNE.

Spurgeon, CHARLES HADDON (1834-92), English Baptist preacher, was born at Kelvedon, Essex, and attached himself to

the Baptists, becoming pastor of a congregation at Waterbeach, Cambridgeshire, in 1852. In 1854 he was called to the almost deserted Baptist church at New Park Street, Southwark, London, and within a year a new church was necessary, and before it was finished the large Metropolitan Tabernacle, in which Spurgeon preached to the end of his life, was found to be needed. His great success was due in part to the fact of his youth, and also to the advertisement which the newspapers, comic and others, gave him; but he had genuine oratorical power and an irrepressible gift of humour, and both the manner and the theology of the older Puritan divines. But while a rigid Calvinist, he was no ascetic, and remained in all his sympathies thoroughly human. His sermons were published weekly. He founded and edited a religious magazine, *The Sword and Trowel* (1865), and wrote *John Ploughman's Talks* (1869) and *John Ploughman's Pictures* (1880). His *Commenting and Commentaries* (1876) and his *Lectures to My Students* (two series, 1875, 1877) were the outcome of his work in the Pastor's College, which he founded as early as 1856. He also founded an undenominational orphanage at Stockwell (1867) and a colportage association. In his zeal for pure doctrine he abandoned the Evangelical Alliance because the Prayer Book taught baptismal regeneration, and the alliance was composed of evangelical



Charles Haddon Spurgeon.
(Photo by Elliott & Fry.)

clergy who said it did not; and in late life his suspicions of the orthodoxy of his Baptist brethren led him to break with a section of his own denomination. See *Pike's Life and Work of Spurgeon* (1892), *Ray's Life of C. H. Spurgeon* (1905), and *Higgs's The Spurgeon Family* (1906).

Spurrey, a popular name of the genus *Spergula*, a subdivision of the *Paronychiaceae* or knot grasses. The common British *S. arvensis*, the corn spurrey, grows in gravelly soil. It has whorls of cylindrical leaves, and bears panicles of white flowers throughout the summer.

Spurs, BATTLE OF. See COURTRAI, GUINEGATE.

Spur Wheel, a toothed wheel, the teeth radiating from the centre.

Spurzheim, JOHANN GASPAR (1776–1832), the founder with Gall of phrenology, was born at Longwich, near Treves. While a student of medicine at the University of Vienna he became acquainted with Gall, and imbibed many of his doctrines. At first they lectured in conjunction, but soon fell apart, and Spurzheim after 1814 devoted himself largely to prosecuting his campaign in England, where George Combe became his disciple. From 1817–25 he was engaged in spreading his views in France. In 1832 he proceeded to the United States, but died soon after landing. His chief works were *Elementary Principles of Education* (1821), *Phrenology* (1825), *Philosophical Principles of Phrenology* (1825), *Manuel de Phrénologie* (1832). See *Memoir* by Carmichael (1833) and *Biographical Notes* by Combe (1834).

Sputum, the medical term for spit, or fluid ejected from the mouth. In a healthy state this is merely saliva, with more or less epithelial débris from the mouth and pharynx and particles of food. It may, however, be mixed with blood or pus, and contain various micro-organisms, such as tubercle bacilli, and fragments of various tissues, epithelium, or lung-tissue.

Spy, a person who secretly and in disguise collects information as to the enemy's condition or designs for the purpose of communicating such information to the opposing force. The use of spies is held to be legitimate in war; but if a spy be captured, he may be lawfully punished with death. To constitute spying, secrecy and disguise are essential conditions. Therefore, however craftily an officer or soldier in uniform may have obtained information, he cannot be punished as a spy if he fall into the enemy's hands, but must be treated as a prisoner of war. A commander may legitimately avail himself of information furnished to him by traitors in the enemy's camp; but to suborn treachery is held to be of doubtful morality, although the thing has not infrequently been done. It is held to be lawful to feign treachery, and to deceive the enemy by giving

false information if he attempts corruption; but the overtture must come from the enemy. It is dishonourable to offer oneself as a traitor and then deceive.

Sq. (sequens), the following.

Sqq. (sequentia), the following (plural).

Squadron, a body of cavalry usually numbering, in the field, from eighty to a hundred and fifty sabres. A cavalry regiment is made up of three, four, or more squadrons, each divided into three or four troops. In the British army a squadron is commanded by a major or captain, with a captain as second in command, and three or four subaltern officers, each subaltern commanding a troop. In the navy a squadron is a division of a fleet, or a detachment of ships employed on special service under the command of a flag-officer.

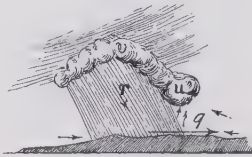


Diagram of 'Line Squall.'

Squall, a sudden strong gust of wind, which may rise for a few seconds to hurricane violence. In a gradually increasing wind the general tendency is for it to blow more and more in gusts. Squalls are frequently associated with thunderstorms, and are usually experienced during a storm after the barometer has touched its lowest point and begun to rise. Sometimes the squall takes place just in the centre of the trough of the cyclone, and in these cases a long, thin, narrow band of rain, accompanied with wind, sweeps across the country like a wall, moving with the same velocity as the depression itself. The general circulation in a 'line squall' is shown in the diagram. Here we may assume that a cold westerly current impinges on a warmer one from the south-east or south. The warmer current ascends, as indicated by the small arrows, and curls over at the black wreath (u) of cloud, and then the commingling of the two currents forms an imposing dark dome (v) of cloud, from which heavy rain (r) or hail descends. The light grayish cloud which is seen behind the black wreath is the rain descending from the dark dome. The heavy raindrops bring down a large quantity of cold air, which flies straight out in advance of the squall, and produces the squall (q) indicated by the long arrow. (See Mossman, 'The Squall of

February 1, 1892,' in *Jour. Scot. Met. Soc.*, vol. ix., pp. 237–255.) The 'white squall' derives its name from the whitening of the sea with foam and spindrift as it traverses the water.

Squarcione, FRANCESCO (1394–1474), Italian painter, born at Padua. He is called the 'father of painting' from his being the founder of one of the first Italian academies of art. Among his pupils was Mantegna. He was chiefly engaged in church decoration, his best-known work being an altar-piece in Padua.

Square, a particular case of a parallelogram, is a regular plane figure with all its sides equal and all its angles right angles. To square any quantity is to multiply it by itself—e.g. $a \times a = a^2$; so a square of six units length of side contains 6×6 , or 36 square units of area. For square measure see WEIGHTS AND MEASURES; see also QUADRATURE.

Square Rig, the rig of a ship whose sails, when in their middle position, are transverse or athwart ships, and which can be braced to a greater or less angle on either side of that position to suit the wind, but which cannot be braced directly fore and aft. Square sails are extended on yards that are slung parallel with the horizon.

Square Root. See INVOLUTION.

Squares, METHOD OF LEAST. By this method the most probable value may be determined from a number of observations, and the accuracy of observations and adjusted results ascertained. If a_1, a_2, \dots, a_n be values of the same quantity derived from different observations of equal precision, the most probable value, x , is that which renders the expression $\frac{1}{x-a_1} + \frac{1}{x-a_2} + \dots + \frac{1}{x-a_n}$ a minimum. The differential of the expression when equated to zero gives the arithmetical mean of the observed values as the most probable value. The probable error (e) of a single observation is given by the equation

$$e = 0.6745 \sqrt{\frac{\sum u^2}{n-1}}, \text{ where } \sum u^2 \text{ is}$$

the sum of the above squares, and the probable error (e) of the arithmetical mean by the equation $e = \frac{e}{\sqrt{n}}$. When the observations are not of equal precision, the squares must be weighted by coefficients derived from the number of observations, the manner of taking the observations, etc., and in this and more complicated cases the most probable value is not the arithmetical mean. By this method the most probable values of the constants or parameters in any function of inde-

pendent variables may be obtained. See Professor Merriam's *Text-Book on the Method of Least Squares* (1892).

Squaring the Circle. See **QUADRATURE**.

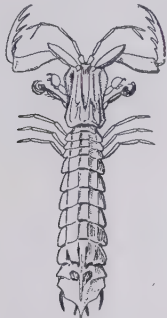
Squash, a term sometimes applied to certain fruits of the pumpkin genus. See **GOURD**.

Squid. See **CUTTLES** and **CEPHALOPODA**.

Squier, EPHRAIM GEORGE (1821-88), American archaeologist, born at Bethlehem in New York state; was editor in Ohio (1841-48); *chargé d'affaires* to Central America (1849); railway surveyor in Honduras (1853); United States commissioner to Peru (1863-5); and consul-general at Honduras (1868 and 1871). His works include *Nicaragua* (1852), *Serpent Symbols* (1852), *Waikua* (1855), *Central America* (1857), *Honduras* (1870), *Peru* (1877).

Squill. See **SCILLA**.

Squilla, a genus of marine Crustacea, which, with some closely allied genera, constitutes the suborder Stomatopoda. The common species is *S. mantis*, so called from its supposed resemblance to the insect mantis. It occurs occasionally in British waters. In the Mediterranean it is abundant, and is used as an article of food. It attains a length of seven inches. The body is slightly flattened, and the short carapace leaves a part of the thorax uncovered. The abdomen ends in a powerful tail fin. The second maxillipedes form powerful prehensile appendages.



Squilla mantis.

Squinting. See **STRABISMUS**.

Squire, armour-bearer and next in degree to the knight, was himself entitled to coat armour, and exempt from jury duties. It is now a title extended to country gentlemen and New England magistrates, and as an epistolary address to most persons of position.

Squirrel, a rodent belonging to the genus *Sciurus*. The squirrel of Europe generally, including Great Britain, is *S. vulgaris*,

which also extends into N. Africa, and is distributed over much of Asia. The body reaches a length of nearly eight inches, the tail, which is very bushy, being about seven inches long. The ears are large, and are furnished with tufts of hair. On the fore limb the thumb is rudimentary, but the other digits are well developed, and are furnished with long, sharp, and curved claws.



Common Squirrel.

The colouring is usually reddish brown above and white below, but sometimes black, gray, or white individuals are met with; in the north the animal always becomes grayish white in winter. The squirrel is an arboreal animal, and climbs and leaps with great agility. Its food consists of nuts, seeds, bark, buds, and young shoots, but at times it eats eggs and even young birds. During winter it hibernates, at least in the more northerly parts of its range; but its sleep is never very profound, and in mild weather it often goes abroad even in the depth of winter. These temporary periods of activity are provided for by the winter store of food. The young are produced in June, in a specially constructed nest, called the 'drey.' The fur of the squirrel is commercially valuable, and there is an extensive trade in squirrel skins in Russia and Siberia. The genus *Sciurus* includes a large number of other species, of which several are Indian. One of the largest is *S. bicolor*, which extends into the Malay Peninsula, and reaches a total length of forty inches or more. For the genus *Tamias* see **CHIPMUNK**. To the genus *Xerus* belong the spiny squirrels of Africa.

Srinagar, cap. of native state of Kashmir, N. India, on the Jhelum, 115 m. N.E. of Rawal Pindi; formerly a shawl-weaving centre, now engaged chiefly in silver-working, carpet-weaving, and the manufacture of paper and leather. Pop. (1901) 122,618.

Srirangam, munic. tn., 2 m. N. of Trichinopoly city, Madras, India, on Coleroon riv., 3 m. N. of Trichinopoly. Its temple of Vishnu is one of the largest in S. India. Pop. (1901) about 21,000.

Srivillipatur, tn., cap. Tinneveli dist., Madras, India, 45 m. S.W. of Madura. An annual car festival is held here. Pop. (1901) about 20,000.

S.S., screw steamer, steamship, saints, Sunday school.

S.S.C., Solicitor before the Supreme Courts (Scotland).

Ssu-mao, or ESMOTE, city, Yün-nan, prov., China, on route from Yün-nan-fu to E. Burma, was opened to foreign trade in 1897.

St. See **SAINT**.

Staal, BARON GEORGES DE (1822), Russian diplomatist. Entering the Foreign Office (1845), he became minister at Stuttgart, Munich, Darmstadt, and Baden (1871-74); ambassador in London (1884-1902).

Staal, MARGUERITE JEANNET, BARONNE DE (1684-1750), French writer, born at Paris, became the confidential secretary and friend of the Duchesse de Maine at Sceaux, and underwent two years' imprisonment in the Bastille rather than betray her secrets. In 1735 she married the Baron de Staal. She is generally designated Staal-Delaunay to distinguish her from Madame de Staël-Holstein. She left valuable *Mémoires* (4 vols., 1755), edited by Lescure (2 vols., 1878); while her *Œuvres Complètes* were published in 2 vols. (1821). See *Life* by Fray (1863) and Sainte-Beuve's *Portraits Littéraires*.

Stabat Mater, a Latin poem sung during Passion week in Roman Catholic churches, and said to have been written near the close of the 13th century by Jacobus Benedictis. Celebrated musical settings of it are those by Palestrina, Pergolesi, Haydn, Astorga, Rossini, and Dvorak.

Stabia, an ancient town in Campania, Italy, a few miles S. of Pompeii. In 89 B.C. it was destroyed by Sulla, but was restored, only to perish with Herculaneum and Pompeii in 79 A.D. It was at Stabia that the elder Pliny died. Excavations were begun in 1750.

Stability, the dynamic condition of a body or system in virtue of which it retains its position or configuration of equilibrium or approximately steady motion. It is usual to distinguish static stability and kinetic stability. The test of static stability is, however, to give a displacement or motion to the body or system. In other words, static stability is conditioned by kinetic stability, and is, in fact, a particular limiting case. The stability of steady motion has many important illustrations, of which the spinning top and bicycle are among the most familiar. The rotating projectile fired from a rifled gun or firearm is another interesting

case of stability, the rotation being effectual in keeping the projectile always pointing in the line of flight. The motions of the solar system give a remarkable case of stability on a large scale. If no dissipative forces exist in the system, it can be demonstrated that such a system will continue in approximately the same configuration for ever, the variations in the form and position of the various orbits being of a fluctuating character, never causing deviations greater than a certain amount. The existence of dissipative or frictional forces, however, leaves no doubt that the history of the system has not been and will not be in accordance with this theoretical conclusion; but during long lapses of time the conditions of everlasting stability are very approximately realized. It is an interesting point that, if we assume the planets to be under the influence of a central force, depending on an inverse power of the distance, stability is not possible for an integral power greater than 2. Dynamically the condition of stability is that the potential energy should be a minimum; but when we deal with physical systems undergoing chemical and thermal changes, it is very difficult to take strict account of this principle. There is no doubt that in the interplay of chemical and physiological processes the conditions for stability and instability are of first importance; and to Willard Gibbs in particular is due the credit of showing how to take account of the complicated thermodynamic relationships involved. See his *Elementary Principles in Statistical Mechanics* (1901).

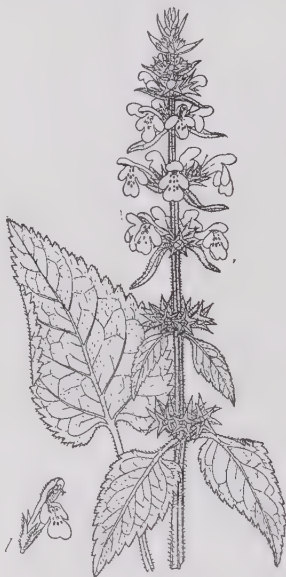
Stachys, HEDGE-NETTLE, or WOUNDWORT, a genus of herbaceous plants belonging to the order Labiata. The flowers have a tubular, bell-shaped, ten-ribbed calyx, an unequally two-lipped corolla, the lower lip being three-lobed, and four stamens, the two front ones being the longest. Among the British species are the common hedge woundwort (*S. sylvatica*), a tall hairy plant, with heart-shaped leaves, and numerous whorls of dull purple flowers, usually six in a whorl; the corn woundwort (*S. arvensis*), a small plant bearing whorls of light purple flowers—six in a whorl—in autumn; and the marsh woundwort (*S. palustris*), the tallest of the native species.

Stade, *tn.*, prov. Hanover, Prussia, 24 m. w. of Hamburg; manufactures leather, cigars, alcohol, and beer. Pop. (1900) 10,545.

Stadholder, or **STADTHOLDER**, corrupt forms of *Stadhouder* (Dutch) and *Statthalter* (German),

a title formerly applied to the governor or lieutenant-governor of a province, and in a higher sense to the chief magistrate of the United Netherlands.

Stadium, an ancient Greek measure of length, equal to 600 Greek feet, the standard being the Olympic stadium, equal to 606 ft. 9 in. The stadium was the distance of the short foot-race at Greek games, and the unit for longer races. The term was also transferred to the racecourse in which the races were held. This had seats for spectators along each side and at one end, which was circular in shape; the other end was straight, being the starting-place. The ancient stadium at Athens has recently been restored by Mr. Averof of Alexandria, and here the Olympic games of 1906 were held.



Stachys sylvatica.
1. Single flower.

Staël (more correctly **STÄEL-HOLSTEIN**), ANNE LOUISE GERMAINE, BARONNE DE (1766-1817), French writer, born at Paris, the daughter of Necker, the great financier of Louis XVI. She was united to Baron de Staël-Holstein, ambassador from Sweden to Paris in 1786, and the same year she began to write her *Lettres sur J. J. Rousseau* (1788). On the outbreak of the French revolution she had to flee, but returning later published a noble defence of Marie Antoinette (1793). She then betook herself to her father's estate of Coppet, on the Lake of Geneva, and there she practically resided

for the next twenty-four years, making, however, long tours to England, Germany, Italy, and elsewhere. Her historic quarrel with Napoleon seems to have begun in 1804, and lasted till his fall, as we learn from her *Dix Années d'Exil*. For that term she was totally banished from Paris, and for three years at least from Coppet. After two short but able essays, *De l'Influence des Passions* (1796) and *De la Littérature Considérée dans ses Rapports avec les Institutions Sociales* (1799), she issued *Delphine* (1802), a novel of great power, descriptive of French society; this was followed by her greatest novel, *Corinne* (1807), and six years later by *De l'Allemagne*, an eloquent account of Germany, its country, people, and literature. Her *Dix Années d'Exil* (1821) and *Considérations sur la Révolution Française* (1818) were published posthumously. After the fall of Napoleon her brilliant salons in the metropolis were reopened. The best edition of her *Œuvres* is that edited by her son (17 vols., 1820-1). Her *Lettres Inédites* appeared in 1903. See *Lives in French* by D'Haussonville (Eng. trans. 1882), and *Sorel* (Eng. trans. 1892), in English by Stevens (1880), and in German by Lady Blennerhasset (Eng. trans. 1889). See also Schük's *The History of a Marriage in Letters* (1906).

Staff, a military term very loosely used in Britain, even officially. In the *Army List* the general officers commanding, the officers commanding their artillery and engineers, the heads of the medical and ordnance departments, are all described as forming part of the 'staff' of a command; while the word 'staff' forms part of the official designation of certain ranks of officers (as 'staff-paymaster'), or even of non-commissioned officers (as 'staff-sergeant'). There was also the Indian Staff Corps, a body of officers now abolished; and the 'colonel on the staff,' who may be a colonel with a command or employed otherwise than on the staff. The officers who, in the British army, correspond more strictly with the staff officers of other countries are those of the headquarter, general, and personal staffs. The officers at headquarters are the chief of the general staff, adjutant-general, quartermaster-general, master general of the ordnance, and military secretary, with their combatant assistants. The scope of their duties is generally given in the article **WAR OFFICE**.

The business of the general staff in all countries is to study all matters which can serve the general in understanding the

situation in which he is placed, in forming his plans, and which may assist him in carrying out his operations, actually in war or prospectively in peace. The arrangement and planning of these operations in detail are also part of its duties, as are also statistics and records of facts and circumstances. On the Continent the 'great general staff' carries out this work on a large scale for the army as a whole; while the staff of each general attends to the special requirements of his command in the same way. The chief staff officer of every staff is the *alter ego* of his general. He issues all the general's orders, and has charge of all documents. In England we superadd to these purely staff duties a large amount of executive and administrative

perience in the field. Those employed in administrative duties are usually selected from the Army Service Corps. Appointments to the staff are for five or for three years. In army corps and divisions the general staff is represented by officers of the adjutant-general's department. In a brigade there is but one general staff officer—the 'brigade-major.' Every district and general officer's local command also has staff officers of the adjutant-general's department.

The personal staff of a general officer consists of one or more aides-de-camp (according to his rank), and in some cases of an assistant military secretary. These officers are usually chosen and recommended for appointment by the general concerned.

year are selected by the Army Council, and enter without examination. The course of study lasts two years, half the number of students entering each year. There are examinations every six months. Those who pass the final examination are preliminarily held qualified for staff appointments. The teaching body consists of seven selected military officers. A staff college for India at Quetta has been formed, and the permanent buildings for it were opened in 1906.

Stafford, munic. and parl. bor., cap. of Staffordshire, England, 16 m. N. of Wolverhampton. St. Mary's is a handsome cruciform structure (nave, 12th century), with a modern monument of Izaak Walton (born at Stafford 1593). St. Chads re-



The Staff College, Camberley.

(Photo by Frith.)

work, connected with discipline, interior economy, drill, and instructions, which in Germany is done by a body of combatant officers distinct from the staff called the *Adjutantur*. In England, also, a section of the general staff administers arms, ammunition, clothing, equipment, supply, transport, quartering of troops, and certain other matters.

In the British army the general staff does not form a separate corps, as was the case in France before the lessons of the war of 1870 caused that country also to break up its staff corps. Those serving as chief staff officers and those who are in charge of purely military duties are chosen either from among the regimental officers who have passed through the Staff College or from those who are qualified for staff duties by ex-

Staffa, isl. of Inner Hebrides, Argyllshire, Scotland, 54 m. w. of Oban; built up of basalt. Area, 71 ac. Caves are numerous, Fingal's, or the Great Cave, being the most remarkable.

Staff College, the institution in which a knowledge of the higher and more advanced subjects of military education is imparted to certain selected officers. It was organized after the Crimean war, as a development of the senior department of the Royal Military College. It is situated at Camberley in Surrey, and accommodates seventy-six students. On entering, officers must have seven years' service, and be under thirty-five years of age. If not captains, they must have qualified for promotion to that rank. A quarter of the number of officers admitted each

contains portions of Norman architecture. Public buildings include County Council Buildings, Shire Hall, Borough Hall, Free and William Salt Libraries, technical and grammar schools, prison, county lunatic asylum, Coton Hill Institution (for insane), brine baths (opened 1892). Slight vestiges remain of the priory of St. Thomas (12th century), and there are several ancient houses. On a hill s.w. of the town are remains of an unfinished castle, erected early in the 19th century on the site of the ancient fortress. Another castle formerly stood within the town. The staple industry is the manufacture of boots and shoes, and salt is made from a brine spring, discovered 1881. The town returns one member to the House of Commons. Pop. (1901) 20,895.

Stafford, WILLIAM HOWARD, VISCOUNT (1614-80), English Roman Catholic nobleman, fifth son of Thomas, Earl of Arundel and Surrey. He was exiled during the civil war. He was accused (1680) of complicity in the Popish plot, on the evidence of Oates, and beheaded on Tower Hill.

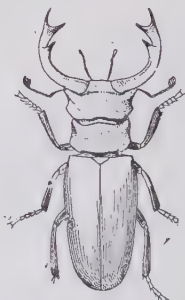
Staffordshire, midland co., England, known as the 'Black

great part of the Derbyshire boundary. Staffordshire has important coal fields. Iron also is mined. Coal (1904), 14,250,911 tons; iron ore, 843,368 tons. The northern coal field is the seat of the 'Potteries,' including Stoke-upon-Trent, Hanley, and Burslem; while on the southern are iron industries (Wolverhampton, Walsall, Dudley, Wednesbury).

tury). The county returns seven members to the House of Commons. Area (anc. co.), 1,171 sq. m.; pop. (1901) 1,236,919; (admin. co.), 1,128 sq. m.; pop. (1901) 879,142.

Stag. See RED DEER.

Stag-beetle (*Lucanus cervus*), the largest European species of beetle, an adult male sometimes reaching a length of over two inches, and having mandibles about one inch long, which bear some resemblance to the antlers of the stag. The stag-beetle is not uncommon in the southern counties of England. The adult feeds on the juices of plants, whose bark it pierces with its strong jaws, while the larva lives in wood, especially that of the oak. The larval state lasts about four years. There is great variation in the size and development of the males, dwarf forms being frequent. Stag-beetles are lamellicorns, related to the Scarabæidæ, or sacred beetles.



Stag-beetle.

Stage. See DRAMA, THEATRE.

Stage-coach. See COACHING.

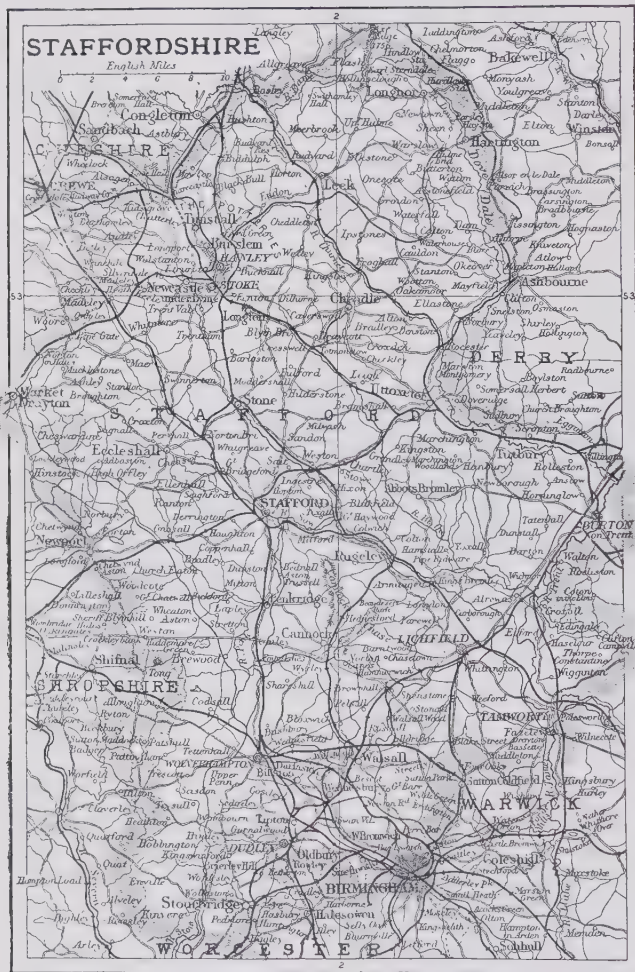
Stage Plays, LICENSING. See THEATRE AND DRAMA.

Staggers. See HORSE—Diseases of.

Stag-horn Moss, the common club moss (*Lycopodium clavatum*), so named from its branched stem. See LYCOPODIUM.

Staghound is nothing else than a pure foxhound, under which heading a description of its points will be found. Mr. Nevill, Hampshire, owns a pack of a strain which he calls 'black St. Huberts'; but they seem to be relics of the old southern hound, the progenitor of so many of the larger varieties of dogs. There are seventeen packs of staghounds in England (including his Majesty's) and five in Ireland.

Stagirus, or STAGIRA, anc. Greek city, on E. side of Chalcidice peninsula, Macedonia. It was the birthplace of Aristotle, who is therefore often called 'the Stagirite.'



Country' from its numerous coal mines and manufacturing localities. Much of the surface is flat, hilly in N. and S. In N. are Axe Edge and Weaver Hills; in S. Sedgley, Clent, and Rowley. Cannock Chase is a heathery tract S.E. of Stafford. The county is drained chiefly to the Humber by the Trent and its affluent the Dove, which forms

Other manufactures are leather and shoes (Stafford), harness and saddlery (Walsall), agricultural implements (Uttoxeter), silk (Leek, Cheadle), ale (Burton-on-Trent). Agriculture is a subordinate industry; a large area is under pasture. Oats is the principal crop. Antiquities include tumuli and earthworks, and ruins of Croxden Abbey (12th cen-

Stagnelius, ERIK JOHAN (1793-1823), Swedish poet; established his literary reputation in 1817 by his epos, *Vladimir den Store*, which was crowned by the Swedish Academy. His chief works, however, are his semi-philosophical, semi-religious collection of poems entitled *Liljor i Saron*, and the dramas *Visbur*, *Sigurd Ring*, *Glädjeflickan i Rom*, *Kärleken efter Döden*, and *Martyrerne*. Stagnelius is one of the most powerful and pathetic of Scandinavian writers. His *Samlede Skrifter* were published in 1830-2 (new ed. 1866-8).

Stahl, FRIEDRICH JULIUS (1802-61), German legal writer, born at Munich, became a convert from Judaism to Protestantism; afterwards devoted himself to the study of law, publishing *Die Philosophie des Rechts* (1830-37). After courses of teaching at Erlangen and Würzburg (1832-40), he became professor of the philosophy of law in Berlin University (1840). As a member of the Chamber of Magnates, he was an ardent conservative in church and state. Among his other works were *Der Christliche Staat* (1847), *Der Protestantismus als Politisches Prinzip* (1853), and *Wider Bunsen* (1856).

Stahl, GEORG ERNST (1660-1734), German chemist, was born at Anspach; appointed professor of medicine and chemistry at Halle in 1694, and physician to the Prussian king in Berlin in 1716. Though his theory of 'phlogiston' was unsound, it at all events was a reasonable attempt to explain combustion and classify it with the phenomena of calcination and reduction of metals, and attracted many adherents. His chief works are *Experimenta et Observationes Chemicæ* (1731) and *Theoria Medica Vera* (1707).

Stained Glass. See GLASS.

Stainer, JACOB (1621-83), Austrian violin-maker, was born at Absam, near Innsbruck. He was the founder of the Tyrolese school of violin-making, and as regards excellence of material and beauty of workmanship, his instruments rank with the best productions of Cremonese makers. Unfortunately the model he used is too high, and the tone of his violins, though pure and penetrating, lacks the essential qualities of roundness and volume. See *Life*, in German, by Ruf (1872).

Stainer, SIR JOHN (1840-1901), English musical composer and organist, born in London. From 1872-88 he was organist of St. Paul's. He was knighted in 1888, and became a professor of music in Oxford (1889). His works include two sacred cantatas, *The Daughter of Jairus* (1878) and *Mary Magdalen* (1883); an ora-

torio, *The Crucifixion* (1887); and a popular *Treatise on Harmony*.

Staines, tn., Middlesex, England, on Thames, at confluence of Colne, 6 m. S.E. of Windsor. St. Mary's occupies the site of a 7th-century church. On the opposite side, a little higher up, is Runnymede, where Magna Charta was signed. Pop. (1901) 6,688.

Stains. See INKS AND STAINS. **Stair**, a Scots family, which took its titular designation from the village of that name in Ayrshire, 'Dalrymples of Stair' appearing in history as early as the reign of James IV. They were always associated with the reformed doctrines, and professed liberal principles. The first member of the house to attain celebrity was JAMES DALRYMPLE OF STAIR (1619-95), who was created by Cromwell one of the lords of Session (1657), and rose to be president of the court (1670). When the Duke of York (afterwards James II.) came to Scotland, Dalrymple had to retire from the bench. He then compiled his *Institutes of the Law of Scotland*. Being a staunch Covenanter, he had to flee to Holland (1682), but returned with William of Orange (1688), and was restored to his position as president of the Court of Session on the death of Lockhart of Carnwath. He was also created Viscount Stair and Lord Glenluce and Stranraer.—His eldest son,

JOHN DALRYMPLE (1648-1707), first Earl of Stair, after suffering imprisonment for the Covenant, was suddenly taken into favour by James II., appointed king's advocate (1687), and lord justice-clerk the following year. After the revolution he was appointed lord advocate, created Earl of Stair (1703), and became a prominent advocate for the union of the kingdoms.—His son, JOHN DALRYMPLE (1673-1747), second Earl of Stair, after distinguishing himself as a soldier under Marlborough, was appointed British minister plenipotentiary in Paris (1715-20), where he did much to thwart the schemes of Cardinal Alberoni to succour the Jacobites. In the war of the Austrian Succession he had persistent ill-fortune, though he showed great personal courage. Sir David Dalrymple, Lord Hailes, was a collateral descendant of the first viscount. See *Stair Annals*, by Murray Graham (1875); also Omond's *Lord Advocates of Scotland* (1883).

Stalactites and Stalagmites occur in caves, and form pillars rising from the floor to the roof, pendent spearlike masses, erect columns, draped curtains, mushroom-shaped projections, and other varied configurations; and

when grouped together they often resemble the vaulted aisles of a cathedral. They are all deposited by the water which drips from apertures and cracks in the roof, and is charged with calcium carbonate in solution. As it evaporates the mineral matter is deposited partly on the roof before it falls, partly on the floor as it soaks away, and two columns grow, one downwards (stalactite), one upwards from below (stalagmite). In the great caverns and grottos—such as Adelsberg (Carniola), the Mammoth Cave, the Peak Cavern, Aggtelek in Hungary, the caves of Central France, Jenolan (New South Wales)—the finest stalactites are found.

Stall, a seat in cathedral and collegiate churches reserved for the clergy and situated in the choir. The term is usually applied to the seat attached to a canonry; a prebendary has the honorary title without the emoluments attaching to a stall. Fine examples of ancient cathedral stalls may be seen at Winchester and Norwich.

Stalybridge, munic. and par. bor., Cheshire, England, on Tame, and on Huddersfield and Manchester Canal, 8 m. N.E. of Stockport. Public buildings include town hall, market hall, Astley Cheetham Free Library (1901), and mechanics' institute. Stamford public park has an area of over 60 acres, and mansion containing library and collections. There are cotton mills, iron foundries, machine and engineering works. The borough returns one member to the House of Commons, Pop. (1901) munic. bor., 27,673; par. bor. 46,602.

Stambul. See CONSTANTINOPLE.

Stambulov, STEPAN NIKOLOF (1854-95), Bulgarian statesman, born at Timova, where he settled as a lawyer. For two years (1884-6) he was president of the Sobrane. On the abdication of Prince Alexander (1886), Stambulov became head of a council of regency, and was successful in obtaining the election of Prince Ferdinand to the throne (1887), with himself as prime minister. His tyranny brought about his dismissal (1894), and in the following year he was killed by Macedonian assassins in Sofia. See Beaman's *M. Stambulov* (1895).

Stamens. See FLOWER.

Stamford. (1.) Municipal bor., Lincolnshire, England, on Welland, partly also in Northamptonshire, 12½ m. N.W. of Peterborough. St. Mary's Church has fine tower and spire (c. 1300); All Saints' contains 15th-century brasses and monuments, and St. John's, St. George's, and St. Martin's are ancient churches.

There are, further, a fine gateway, formerly belonging to Brazenose College, ruins of a Benedictine priory church (11th century), and mediæval hospitals, called *calises* (from the Calais merchants with whom the town had trade), the oldest being Browne's Hospital (15th century). Industrial establishments include coach factories,

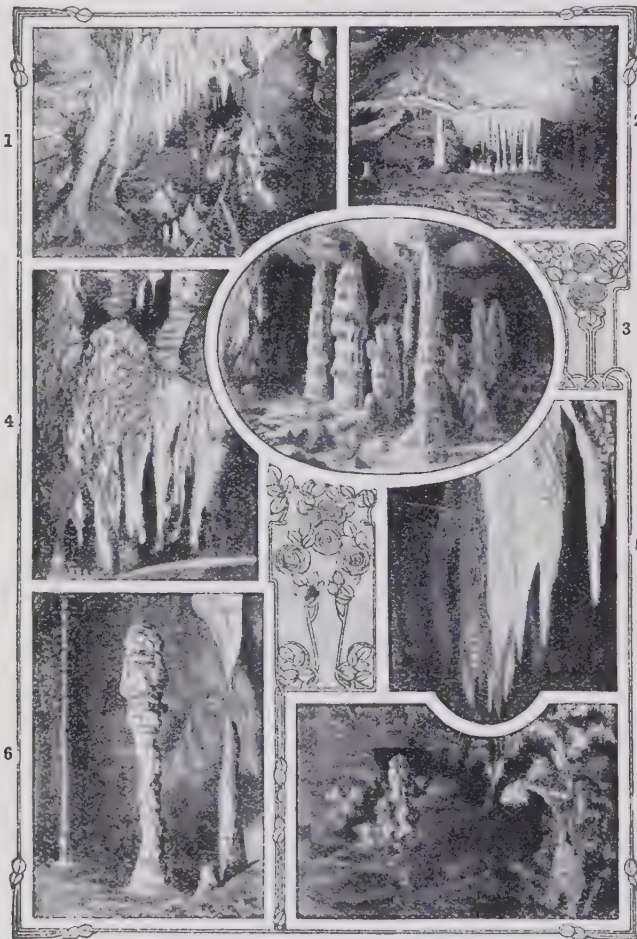
ing a rich collection of pictures. Pop. (1901) 7,218. (2.) City, Fairfield co., Connecticut, U.S.A., 40 m. s.w. of New Haven. It produces hardware. Pop. (1900) 15,997.

Stamford Bridge, vil., E. Riding, Yorkshire, England, on Derwent, 8 m. N.E. of York. Near this was fought (1066) the battle

the mouth aright for consonant production he forgets to use his respiratory and laryngeal apparatus for the production of voice. But even bad stammerers do not stammer when they sing, because in singing the thoughts are concentrated upon the production of voice. A second phenomenon associated with stammering is the occurrence of spasmodic muscular convulsions. The tongue may be protruded, the eyes wink, or more complex facial contortions display the stammerer's anxiety and effort. While forgetting his respiratory muscles and larynx, the stammerer sends message after message to the nerve centres which control the muscles of the mouth and tongue employed in speech. From the nerve centres surcharged by successive messages the energy overflows to neighbouring centres, so that other facial muscles contract, and frequent repetition of these movements leads to the establishment of a habit spasm. In the treatment of the condition the stammerer must be carefully taught the mechanism and physiology of speech. He must also acquire the habit of filling his lungs with air before he attempts to speak, and by slow and careful practice must accustom himself to synchronize the laryngeal with the oral movements. Reading aloud for a definite period each day is beneficial. See Professor Wyllie's *The Disorders of Speech* (1894).

Stamp Act, an act passed by Grenville in the British Parliament (1765) for the purposes of military defence in the American colonies. But the colonists resented this dictation; and when the Grenville ministry was succeeded by the Rockingham ministry, the Stamp Act was immediately repealed (1766). But in passing the act of repeal a resolution affirming the right of the Imperial Parliament to tax the colonies at its pleasure and discretion was also adopted. The colonists were more indignant at the resolution than grateful for the repeal. The object of the act was quickly accomplished in 1772, when by withdrawing the imperial troops from the colonies the imperial government threw on them the burden of their own military defence.

Stamp Duties, a term usually confined to the duties imposed by the Stamp Act, 1891 (54 and 55 Vict. c. 39), and acts amending it. The death duties are also levied by way of stamps, but are dealt with separately (see **DEATH DUTIES**). The Dutch seem to have been the first to devise stamps and stamp duties in 1624; but stamps were not introduced into England until 1694, in order to raise money to carry on the



Stalactites.

1. End of Imperial Cave, Jenolan, N.S.W. 2. Nelly's Grotto, Jenolan. (Photos by Kerry.) 3. The Ballroom, Nettle Cave, Jenolan. (Photo by N. P. Edwards.) 4-6. Cox's Cave, Cheddar. 7. Wookey Hole: 'The Witch.' (Photos by Frith.)

agricultural implement, motor, and engineering works. Stamford was one of the 'five burghs' of the Danes. Brazenose College was founded in 1333. After the battle of St. Albans (1461) the town suffered terribly at the hands of the Lancastrians. South-west of the town, in Northamptonshire, is Burghley, with magnificent park and mansion, contain-

between Harold of England and Harold Hardrada of Norway, in which the latter was slain.

Stammering, or **STUTTERING**, is a spasmodic disorder of speech, in which the production of certain sounds is arrested. A stammerer's chief difficulty lies in harmonizing the mechanism for vowel sounds and consonantal sounds. In his effort to shape

war with France. In 1765 they came into prominence when Grenville's Stamp Act (5 George III. c. 12) led to the revolt of the American colonies. The stamp duties are leviable on agreements, awards, bonds, conveyances, marketable securities, mortgages, policies, receipts. The management of stamp duties is regulated by 54 and 55 Vict. c. 38, which deals with the sale of stamps, allowances for spoiled stamps, offences, discontinuance of dies, and provides that the duties are to be under the care and arrangement of the Commissioners of Inland Revenue. Documents which require a stamp cannot be produced in evidence without one, but in most cases they can be stamped on the payment of a penalty of £10. Stamps may be either 'adhesive' or 'impressed' on the document: wills are usually stamped with the adhesive token; bills of exchange, promissory notes, and the like with the impressed stamp. As the stamp is, in most cases, the witness of the execution of a definite action, it must be appended at the moment of entering upon that undertaking to which it bears record, and must be cancelled at the moment of fulfilment thereof. Receipt stamps must be used to testify to the payment of all sums over £2. Spoiled or misused stamps are not a dead loss to the parties spoiling them, but are specially allowed for by the Commissioners on application being made. See Dowell on *Stamp Duties* (1873).

Stamps. See POST OFFICE, MINING, and ENGINEERING.

Standard. See FLAG.

Standard. See CURRENCY, MONEY, BIMETALLISM, WEIGHTS, and MEASURES.

Standard, THE, began its existence in 1827 as an evening paper, published three times a week. It was edited by Dr. Stanley Lees Giffard, in the interests of Wellington and Peel and the opponents of Catholic emancipation. The peculiar tenacity of its political opinions earned for it the nickname of 'Mrs. Gamp.' The *Standard* sank steadily in influence until the bankruptcy of its proprietor, Charles Baldwin, in 1857. The property was then acquired by James Johnstone, who at once converted it from an evening into a morning paper, and in the following year reduced the price from twopence to a penny, while doubling the size of the issue. After these changes the paper soon took a leading place among the London dailies. Among the writers in the *Standard* between 1860 and 1870 was Lord Robert Cecil, afterwards third Marquis of Salisbury and prime minister. In 1876 James Johnstone died, and Wil-

liam Heseltine Mudford took over the direction of the paper on behalf of the heirs, at that time minors. Among the leader-writers under Mudford were Sir Alfred Austin (poet laureate) and Mr. T. H. S. Escott, and later Mr. Sidney Low, while Miss Frances Power Cobbe, Professor Palmer, Sutherland Edwards, and G. A. Henty were regular contributors. Mudford resigned the direction of the paper in 1900, and was succeeded by Mr. George Byrom Curtis. In November 1904 the Johnstone family sold the newspaper to a company controlled by Mr. C. A. Pearson, when Mr. H. A. Gwynne, its present editor, was appointed. The evening issue of the *Standard* is still continued in conjunction with the *St. James's Gazette*.



*British Royal Standard
(English quartering).*

Standards, ROYAL, are heraldic banners rather than standards, the essentials of a true standard (in England) being that it shall have the red cross of St. George next to the staff, with the rest of the flag bearing the appropriate device of the bearer; that it shall be split at the end, and rounded off; and that it shall contain the cognizance of the owner. The three lions were not established as the royal arms until they appeared on the great seal of Richard Cœur de Lion in 1195. In the modern arms the rampant lion within a tressure or border represents the arms of the kings of Scotland, and is found on the great seal of Alexander II. about 1230. The harp in the third quartering, for Ireland, first appeared in the royal arms in 1603. Its adoption was by virtue of conquest, and not of the political union of Jan. 1, 1801. Edward III. in 1340 claimed the crown of France, and quartered the golden fleurs-de-lis of that country. When George I. came to the throne, the arms of Hanover were added; but when Victoria succeeded William IV., the Salic law caused the removal of the Hanoverian arms, and the royal standard became what it is to-day.

The imperial standard of Germany consists of the black iron cross with white border on a field of gold. In the centre is a shield

bearing the arms of Prussia, surmounted by a crown and surrounded by the collar of the order of the Black Eagle. The Czar's imperial standard is yellow, bearing the black two-headed eagle displayed. Its distinctive features are, that both heads are crowned; that on the breast is a red shield with a figure of St. George and the dragon in white, surrounded by a golden collar of St. Andrew's order; that in the dexter talon is a sceptre, and that on the wings of the eagle are four shields representing incorporated territory. The royal standard of Spain bears in the first quarter the golden tower on red for Castile, and the red lion on white for Leon, arranged quarterly; second quarter (a) the nine vertical yellow and red bars of Aragon, and (b) the device of Sicily, the same vertical bars surmounted by two demi-lozenges inverted, argent, a spread eagle sable, these two portions being arranged side by side; third quarter, (a) the red and white horizontal stripes of Austria, above (b) the yellow and blue diagonal bars, surmounted by a red border for Burgundy, and (c) the black lion on golden ground of Flanders; fourth quarter, (a) the fleurs-de-lis and red and white checkers of Burgundy, (b) the golden lion rampant on black for Brabant, and (c) the red spread eagle on white for Antwerp. The whole is charged with two escutcheons vertically placed—(1) the arms of Portugal, (2) three golden fleurs-de-lis on blue within a red border for France.

Standerton, tn., Transvaal colony, British S. Africa, on the Vaal, 80 m. s.e. of Johannesburg. Pop. (1904) 3,899.

Standing Orders (Parliamentary), the permanent resolutions which the House of Lords and the House of Commons have agreed to for the regulation, guidance, and order of their proceedings. Each house has its own standing orders, and those of one house have no force in or application to the other house. The oldest standing orders of the House of Commons date from the years 1707, 1713, and 1715. The later changes, which, in their cumulative effect, amount almost to a revolution in the procedure of the House, began with the adoption in 1882 of the Closure Resolution, and many of the subsequent amendments have been in the direction of greater stringency. At the same time they have seriously diminished 'the rights and privileges' of unofficial members, and have greatly increased the power residing in the executive. The standing orders of both houses are liable to suspension, after notice, for

the purpose of facilitating the passing of a particular measure or of winding up the outstanding business of a session.

Standing Stones. See CIRCLES OF STONE.

Standish, MYLES (?1584-1656), British colonist, was born probably at Duxbury in Lancashire; joined the Puritan colony at Leyden (1609), and with them set sail in the *Mayflower* for America in 1620. The pilgrims landed in New England, and Standish became their military chief against the Indians, and later against French intruders. The most noteworthy incident of his office was the crushing of an Indian confederacy at Weymouth (1822). See Longfellow's poem and De Costa's *Footprints of Miles Standish* (1864).

Stand Pipe, a tall pipe open to the water main at the foot and to the air at the top, and used at pumping stations for equalizing or taking up the successive impulses of the pump which is supplying water to the mains, in order that a continuous stream may be delivered. Air vessels are used as cushions for the same purpose. See PUMPS and WATER SUPPLY.

Stanfield, CLARKSON (1793-1867), English marine painter, born at Sunderland. Disabled by an accident whilst in the navy, he became a scene-painter, first in Edinburgh and then in London. He exhibited *A Calm* at the Royal Academy (1827), and in 1831 received a commission from William IV. for *The Ceremony of Opening New London Bridge and Portsmouth Harbour*. In the following year he was elected A.R.A., and R.A. in 1835. His work is remarkable for his great technical knowledge of shipping and the sea, and for the originality and realism of his treatment. In the National Gallery and South Kensington Museum are pictures by him.

Stanford, SIR CHARLES VILLIERS (1852), Irish musical composer and conductor, born in Dublin. In 1872 he became organist of Trinity College; was appointed professor of composition and orchestral playing in the Royal College (1882) and professor of music at Cambridge (1887). He stands in the front rank of British composers, and his productions comprise operas, choral-orchestral works in various forms, symphonies, orchestral suites, chamber music, compositions for piano and for violin, and numerous songs.

Stanford, LELAND (1824-93), American railway contractor and millionaire, who built the Central Pacific line. He was born at Watervliet in New York State, and settled in California in 1856.

He was governor (1861) of that state and United States senator (1885), but he is principally known as the founder of the Leland Stanford Junior University at Palo Alto in California, in memory of his son. It was opened in 1891, but was wrecked by the earthquake of April 18, 1906.

Stang, FREDERIK (1808-84), Norwegian statesman; chief of the department of the interior (1845-56). During the illness of the king in 1857 he was one of the members of the interim government. In 1861 he formed a new ministry, which he reconstructed in 1873, but resigned in 1880. His work, *Om den Kongelige Sanktionsret efter Norges Grundlov* (1883), is an important contribution to the constitutional question in Norway.

Stanger, tn., Natal, 50 m. N.E. of Durban. Here is the burial-place of the Zulu king Chaka.

Stanhope, mrkt. tn., Durham, England, 21 m. w. of Durham, on the Wear. The bishops of Durham had formerly a hunting park here. Stanhope Dean is a picturesque recreation ground. Pop. (1901) 1,964.

Stanhope, CHARLES, THIRD EARL STANHOPE (1753-1816), English politician and scientist, was born in London. He was created F.R.S. in 1772, having published a memoir on the pendulum and a volume dealing with the coinage. He made numerous experiments regarding the application of steam to ships; made great improvements in the art of printing, inventing a printing press, which, like his microscopic lens, is known by his name; and constructed calculating machines. In politics he first allied himself with the younger Pitt, but disapproved of the war with the colonies, and heartily approved of the French revolution. He was a steady advocate of the cause of the slave, was earnest for education, fiscal reform, electoral reform, and spoke and wrote on the monetary questions of his day. See Fletcher's *The Late Earl Stanhope's Opinions* (1819).

Stanhope, LADY HESTER LUCY (1776-1839), the eccentric daughter of the third Earl Stanhope. She kept house for her uncle, the younger Pitt (1803-6), and many stories are told of her brilliant manner and wit. She wielded an enormous political influence. After Pitt's death she set out for the East (1810), and settling among the Druses of Mount Lebanon, constructed a kind of mediæval castle and maintained a sort of mediæval state. She died as she had lived—proud, isolated, and eccentric. See Meryon's *Travels of Lady Hester Stanhope* (1846) and *Memoirs of Lady Hester Stanhope*

(1854); also Kinglake's *Eöthen* (ed. 1895).

Stanhope, JAMES, FIRST EARL STANHOPE (1673-1721), British statesman and general, was born in Paris. After service in Italy and Flanders and in the Peninsula, he was dispatched with Peterborough's expedition to Spain (1705), his main achievement being the capture of Port Mahon in the Balearic Isles. In 1710 he was captured by the French, but returned to England in 1712. He took an active part in the suppression of the Jacobite rebellion of 1715, and in passing the Septennial Act; but his strongest inclination was for foreign affairs. The Peerage Bill, which he promoted, was a failure, owing to Walpole's opposition; but the collapse of the South Sea Bubble, which occurred in 1720 while he was first minister, raised such an outcry against the ministry that his health gave way under the strain.



Dean Stanley.

(Photo by London Stereoscopic Co.)

Stanhope, PHILIP HENRY, FIFTH EARL STANHOPE (1805-75), English historian, was born at Walmer. He sat in the House of Commons from 1830 till 1852, and was under-secretary for foreign affairs (1834-5) and secretary of the India Board (1845); but he shared Peel's conversion to, and loss of office on account of, free trade. His chief parliamentary monuments are the Copyright Act (1842), the National Portrait Gallery (1856), and the Historical Manuscripts Commission (1869). It is mainly as a historian that he is noted. He had access to private documents inaccessible to other writers, and his *History of the War of Succession in Spain* (1832) is on that account specially valuable. He published also *The History of England from the*

Peace of Utrecht to the Peace of Versailles (1836-53), and a connecting link, entitled *The History of England, comprising the Reign of Queen Anne to the Peace of Utrecht* (1870). His most important work outside this series was *The Life of the Right Hon. William Pitt* (1861-2).

Stanislau, cap. of dist. of same name, Galicia, Austria, on Bistrizta, 58 m. s.w. of Tarnopol; has railway workshops, tanneries, flour mills, dye works, and tile works. Pop. (1900) 29,628.

Stanislaus. See POLAND.

Stanley, vil., Perthshire, Scotland, on r. bk. of Tay, 74 m. N.W. of Perth; has cotton mills, erected under the auspices of Richard Arkwright in 1785. Stanley House, to the E., was a seat of the Lords Nairne.

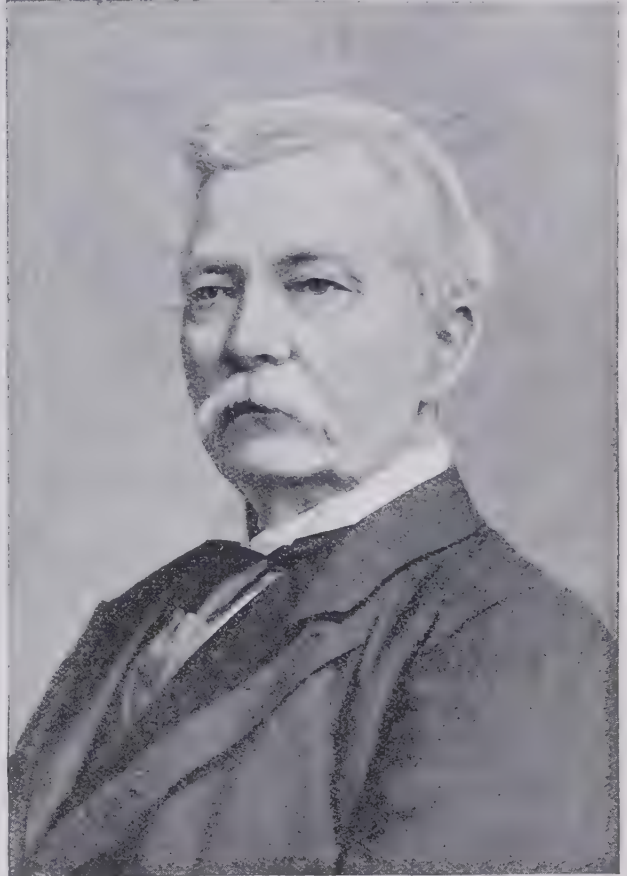
Stanley. See DERBY, EARLOF.

Stanley, ARTHUR PENRHYN (1815-81), English scholar and divine. A pupil of Dr. Arnold at Rugby, he became a fellow of University College, Oxford, in 1838, and in 1839 was ordained. Stanley was neither a High Churchman nor an Evangelical, and was therefore suspected by both parties; and it was only the appointment of Dr. Arnold to the chair of modern history in 1841 that reconciled him to stay at the university. The sudden death of Arnold in 1842 led Stanley to write his greatest and only permanent book, *The Life and Correspondence of Dr. Arnold* (1844). He continued to live at Oxford, and in his *Sermons on the Apostolical Age* (1847) he became marked as the Broad Church leader. After his *Commentary on Corinthians* (1855) he confined himself to historical and descriptive work. Many of his best books arose out of his vacation journeys—*Sinai and Palestine* (1856) and *Lectures on the Eastern Church* (1861). He became canon of Canterbury in 1851 (*Memorials of Canterbury*, 1854), and in 1856 returned to Oxford to the chair of ecclesiastical history and a canonry at Christ Church. In 1864, after a journey to the East in the train of the young Prince of Wales, he was appointed to the deanery of Westminster, where he was able to put in practice his convictions regarding the comprehensive and Broad Church character of the Church of England. He invited ministers of all Christian churches to his pulpit. See Prothero's *Life* (1893) and Bradley's *Recollections* (1883).

Stanley, SIR HENRY MORTON (1841-1904), journalist and African explorer, whose original name was James Rowlands, was born at Denbigh in Wales. At seven-

teen he sailed to New Orleans, and found employment with Mr. H. M. Stanley. Having assumed the name of his benefactor, Stanley served during the American civil war, and then entered on a journalistic career. His first important journey was to Magdala with the British army as war correspondent for the *New York Herald*. In 1869 Stanley was commissioned to find Living-

stone he circumnavigated the Victoria Nyanza and Lake Tanganyika, partly surveyed the Albert Nyanza, and traced the Congo from Nyangwe, the lowest point on the Lualaba reached by Cameron and Livingstone, to the highest point reached from the ocean by Tuckey in 1816, proceeding thence to Banana. He returned to the Congo at the instance of the king of the Belgians,



Sir Henry M. Stanley.
(Photo by Russell & Sons.)

stone, and met him on Nov. 10, 1871, at Ujiji, on Lake Tanganyika, and returned to the coast at Bagamoyo, bringing with him the traveller's journals and papers. On his return from the Ashanti expedition of 1873-4 he was provided by the proprietors of the *Daily Telegraph* and *New York Herald* with funds for a journey across Central Africa, which he commenced from Bagamoyo on Nov. 17, 1874. On this

and remained there from August 1879 till June 1884. Stanley's last visit to Africa (1887) was as leader of the Emin Pasha relief expedition, when he discovered Ruwenzori and the Albert Edward Nyanza. The following year, on June 12, he married Miss Dorothy Tennant, and in 1899 he received the Grand Cross of St. Michael and St. George. From 1895 to 1900 he sat in Parliament as member for North Lambeth.

His chief works are *How I Found Livingston* (1872), *Coomassi and Magdala* (1874), *Through the Dark Continent* (1878), *The Congo and the Founding of its Free State* (1885), *In Darkest Africa* (1890), and *My Early Travels and Adventures* (1895).

Stanley, THOMAS (1625-78), English poet and classical scholar, was born at Cumberlow, Herts. He studied law at the Middle Temple, but preferred to devote himself to letters. In addition to two volumes of *Poems* (1647 and 1651), including a translation of *Anacreon* (ed. A. H. Bullen, 1893), he produced a *History of Philosophy* (1655-62) and an ed. of *Æschylus* (1663). His *Collected Poems* were ed. by S. E. Brydges in 1814-5.

Stanley Pool, expansion (25 m. by 16 m.) of Lower Congo, Africa, above the rapids 4° S.

Stannmore, ARTHUR HAMILTON GORDON, BARON (1829), British colonial governor, youngest son of the fourth Earl of Aberdeen, whose biographer he became in the Prime Ministers of Queen Victoria Series (1893). He was secretary to Gladstone's Corfu mission (1858-9), governor of New Brunswick (1861-6), of Trinidad (1866-70), Mauritius (1871-4), Fiji (1875-80), New Zealand (1880-2), and Ceylon (1883-90). During 1877-83 he was high commissioner for the Western Pacific. He sat in the House of Commons as member for Beverley (1854-7), and was raised to the peerage in 1893. He is author of *Wilderness Journeys in New Brunswick* (1864) and *Story of a Little War* (1879).

Stannard, MRS. ARTHUR (1856), English novelist, writing under the name of 'John Strange Winter,' was born in York; wrote her first story in 1874, and since that date has produced a large number of novels, dealing chiefly with army life and character. Her works, which were the favourite fiction of Ruskin, include *Bootes' Baby* (1885), *Army Society* (1886), *Beautiful Jim* (1888), *Grip* (1896), *The Man I Loved* (1901), *Uncle Charles* (1902), *Love and Twenty* (1905), and many other books.

Stannaries, those districts in Cornwall and Devon where special customs as to tin-mining, and special courts in which tin miners may sue and be sued, have existed from time immemorial. Up to 1752, twenty-four stannators were elected, and convened as a stannary parliament by the lord warden under a writ from the Duke of Cornwall. In 1836 an act was passed which suppressed the courts of the different stannaries, and transferred their jurisdiction to the vice-warden. By the Stannaries

Court (Abolition) Act, 1896 (59 and 60 Vict. c. 45), this jurisdiction has been again transferred to the county court, from which an appeal lies to the Court of Appeal. This jurisdiction is both in respect of common law and equity, and extends to the winding up of stannary companies, while on the rectification of the registers of such company the High Court has concurrent jurisdiction. In Cornwall the common law jurisdiction is wider than in Devonshire, extending to most personal actions where either party is a miner, while in Devon the jurisdiction is limited to matters relating to mines. Within the jurisdiction of the lord warden a right to mine tin, under the custom called 'tin bounding,' may be acquired as against the owner of the soil, subject to rendering to him a portion of the produce, usually amounting to one-fifteenth, but in some places, by special custom, to a twelfth or a tenth.

Companies which work mines on what is known as the cost-book system, although not absolutely confined to the stannaries, were first known and chiefly exist there. A licence to search for minerals is obtained by one or two persons, and then the persons who intend to become adventurers meet and decide as to the regulations under which the company is to work, the number of the shares, the allotment of the shares among them, and the liability to contribute to the working expenses. These particulars, together with the names and addresses of the adventurers, are entered in the cost book, or the book kept for the purpose of entering the working expenses.

Stannic Acid. See TIN.

Stansfeld, SIR JAMES (1820-98), British politician, born at Halifax, Yorkshire; became member for Halifax (1859), was a lord of the Admiralty (1863-4), financial secretary to the Treasury (1869-71), and president of the Local Government Board (1871-4 and 1886). He is chiefly known for his opposition to the Contagious Diseases Acts, of which he obtained the repeal, and for his support of woman's suffrage. See Stansfeld's *The Family of Stansfeld* (1885).

Stanton Drew, par., Somerset, England, 7 m. S. of Bristol, with a group of stone circles. The great circle has a diameter of 368 ft. (Dymond).

Stanyhurst, RICHARD (1547-1618), translator of Virgil, was born in Dublin. In 1577 he published, in vol. i. of *Holinshed's Chronicles*, his *Description of Ireland* and his *History of Ireland*. His translation of the first four

books of the *Æneid* (1582) illustrated the contention of Gabriel Harvey, that quantity rather than accent should govern English prosody. In 1602 he became a convert to Roman Catholicism, and was then involved in various Catholic and Spanish plots against England. See Arber's introduction to a reprint of his *Translation* (1895).

Stapeldon, WALTER DE (1261-1326), bishop of Exeter, was born at Monkleigh, Devonshire. He was successively professor of canon law at Oxford, chaplain to Pope Clement v., and bishop of Exeter (1307-26). He was responsible for finishing the building of the cathedral, and, with his brother, was the founder of Exeter College, Oxford. He was sent on missions to France (1306, 1313, 1319), became lord high treasurer (1320). On the flight of Edward II. from London, he was left in charge of the city, and was murdered by the mob in Cheapside.

Stapier, PAUL (1840), French essayist, born at Paris, became professor of French at the Collège Elizabeth, Guernsey, and of foreign literature at Geneva (1876). He was afterwards appointed to a chair at Grenoble and at Bordeaux. He has written *Petite Comédie de la Critique Littéraire* (1866), *Causeries Guernésiennes* (1869), *Lawrence Sterne* (1870), *Molière et Shakspeare* (1886), *Racine et Victor Hugo* (1887), and *La Grande Prédication Chrétienne en France* (1898).

Staple. The staple system was a method of regulating the export trade with a view (1) to maintaining the prices of exports, and (2) to facilitating the collection of the king's customs. The staple exports were wool, wool-fells, leather, lead, and tin. The earliest form of the system was the selection of a town in Flanders as the sole market in which English wool might be sold. This led to quarrels and to changes of the staple town, and eventually to the transfer of the staple to certain English towns (1353). But this method did not answer; and when Calais fell into English hands (1363) the staple was removed thither, and there it remained till the capture of Calais in 1558.

Star, THE, London evening paper, was founded in 1888 by Mr. T. P. O'Connor, who acted as its editor. The Home Rule struggle was at its height when the *Star* appeared, at the price of a halfpenny, as an uncompromising supporter of Gladstone's policy. It presented for the first time in England some of the attractive features of American journalism. In 1891 Professor James Stuart became chair-

man of directors, and Mr. Ernest Parke was appointed managing editor. Until 1900 the dramatic criticisms in the *Star* were written by Mr. A. B. Walkley, and its literary articles have always been a feature of the paper. The *Star* was one of the few journals to resist the popular sentiment during the South African war.

Star Apple, the popular name of shrubs and trees belonging to the genus *Chrysophyllum*, a subdivision of the order Sapotaceae. *C. cainito*, a native of the W. Indies, is the best known species. It bears delicious fruit, beautifully coloured green, yellow, and red. All the species are natives of the tropics.

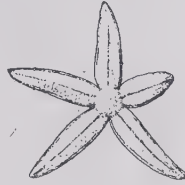
Staraya-Russa, tn., Novgorod gov., Central Russia, 36 m. S. of Novgorod city. It is an episcopal see (cathedral, built in 1701), and has an imperial palace, saline baths, salt deposits, and tanneries, brick fields, sawmills, and tallow foundries. Pop. (1897) 15,234.

Stara-Zagora (Turk. *Eski-Zagra*), tn., S. of Balkans, E. Roumelia, Bulgaria, 50 m. N.E. of Philippopolis; manufactures coarse cloth and copper, and has tanneries and mineral springs. Totally destroyed by the Turks in 1878 and rebuilt on modern lines. Pop. (1901) 19,428.

Starch, ($C_6H_{10}O_5$)_n, a carbohydrate of undetermined composition, found in granules of varying size in different plants. Cereals contain most—rice approximately 76 per cent., maize and wheat 70 per cent., peas 50 per cent., and potatoes 20 per cent. Starch is prepared from such sources by grinding, rasping, or fermentation; the starch granules are then washed out and allowed to settle after the liquid has been strained from the cellular tissue. Starch is insoluble in cold water, but swells up and becomes gelatinous with hot. It is coloured intensely blue by iodine. When it is boiled with dilute acids, glucose is obtained, and by the action of diastase it is converted into maltose; dextrin is an intermediate product that is also obtained by heating alone. Starch is also converted into maltose and dextrin by the action of the saliva and pancreatic juice, and is thus a valuable food.

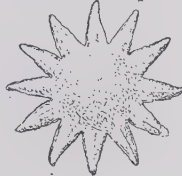
Star Chamber, an English court, founded in 1487 by Henry VII. Tradition says that it derived its name from the golden stars which decorated the ceiling of the room in which it met. It revived certain of the former powers of the king's council, but in such a manner as to constitute a new court of justice. The reason for its creation was the desire of the king to curb and bring fully under the law of the land the

greater nobles, who were in their own districts powerful enough to overawe both judge and jury. Its function was to punish the misdemeanours of sheriffs and juries, and all illegal assemblies and disturbances. The new court was composed of the chancellor, the treasurer, the keeper of the privy seal, the president of the council, a bishop, and the chief justices. It had jurisdiction over all cases short of capital offences, both civil and criminal. In the hands of Laud it became the instrument of oppression. Torture was freely used to extort confession of some sort, whereupon the proceedings became oral, and the prisoner was condemned without ever having been given a chance of being heard in his own defence. In 1641 it was abolished.



Starfish (*Asterias rubens*).

Starfish form the class Asteroidea of the phylum Echinodermata. A considerable number of species occur between tide-marks on the British shores, one of the commonest being *Asterias rubens*, often called the common starfish. Its other popular name of 'five-finger' refers to the number of rays or arms, but another common form, the sun-star (*Solaster*



Sun-star (*Solaster papposus*).

papposus), has from eleven to fourteen rays. On the under surface of the common starfish is the central mouth, from which lead five open grooves, extending to the tips of the arms. These are the ambulacral grooves, and lodge the numerous tube-feet, which are the organs of locomotion, and terminate in suckers. On the upper surface are the spines, which have the curious pedicellariæ mingled with them. Less conspicuous are the delicate skin-gills, protrusions of the skin which serve for purposes of respiration. Between two of the arms on the dorsal surface lies the madre-

porite, or perforated plate, which allows of the entrance of water into the water-vascular system. The anus is a minute opening also on the dorsal surface. The viscera extend into the arms. Starfish feed chiefly upon bivalve molluscs, and are very destructive to oyster and mussel beds. They do not as a rule mutilate themselves so readily as do brittle-stars, but possess a remarkable power of regenerating parts of the body which have been accidentally injured. The sexes are separate, and the free-swimming larva is known either as a bipinnaria or as a brachiolaria. Besides the two genera mentioned, species of *Astropecten*, *Porania*, *Henricia*, and *Luidia* are also British. See Jeffrey Bell's *Catalogue of British Echinodermata in the British Museum* (1892), and Forbes's *British Starfishes* (1841).

Stargard, tn., prov. Pomerania, Prussia, 22 m. by rail E. of Stettin. The cathedral dates from the 14th century. The town manufactures machinery and woollen and cotton goods. Pop. (1900) 26,858.

Starli-Krim, or *ESKI-KRIM*, tnship., Crimea, 15 m. W. of Feodosia, on the S. coast of the peninsula; the first capital of the Nogai khans in the 13th century.

Starkie, WILLIAM JOSEPH MYLES (1860), commissioner of national education, Ireland, since 1899, was born in Sligo. He became professor of classical literature in the Catholic University of Ireland (1883-6), and subsequently president of Queen's College, Galway (1897-9). Among his works are an edition of the *Wasps* of Aristophanes (1897), and one of Sophocles in the Oxford Texts (1903).

Starley, JAMES (1831-81), improver of the bicycle and inventor of the tricycle, was born at Albourne in Sussex. In 1855 he found employment with a sewing-machine manufacturer; and in 1868, after seeing a French bicycle, he began a series of inventions and improvements which resulted in the Coventry model; then the Ariel, with pivot centre steering; then the tangent bicycle; and the Coventry tricycle, which was in every part his own invention. Subsequently appeared the Salvo quadricycle.

Starling (*Sturnus vulgaris*), a passerine bird, generally distributed throughout temperate Europe. It destroys vast numbers of the larvæ of the crane-fly, as well as of other insects; but it attacks cultivated fruit, sometimes causing great destruction in orchards on account of its large numbers. It also eats the eggs and young of other birds. The diet further includes worms, slugs, and snails, wild berries, and

even small mammals. The nests are usually constructed in holes in walls or buildings, or in banks and cliffs, or even in trees. To a



Common Starling.

considerable extent the birds roost in companies, and assemble in large flocks in the evening. The starling has considerable power of song, but much more striking is the habit of imitating the note of other birds, or even mere noises. The blackbird is frequently mimicked. The male in summer has the plumage black, shot with brilliant metallic reflections. After the autumn moult it is spotted with buff above and white below. In S. Europe the common starling of Britain is replaced by the black starling (*S. unicolor*). To the starlings in the wide sense (family Sturnidæ) belong a large number of beautiful birds—e.g. pastor, myna, and grackle. The last-named belongs to the tree-starlings, which are sometimes erected into a separate family as the Eulabetidæ. Of the tree-starlings, the glossy starlings (*Lamprolornis*) of Africa have a beautiful plumage, displaying shades of bluish-green, purple, and violet, relieved by golden bronze. Starlings occur also in India and Africa, but there are no American species.

Star-nose. See SHREW-MOLE.

Staro-Byelsk, tn., Kharkov gov., S. Russia, 130 m. E.S.E. of Kharkov city. It has flour mills, tallow foundries, and manufactures of candles and Astrakhan caps. Pop. (1897) 13,128.

Starodub, tn., Chernigov gov., S.W. Russia, 94 m. N.N.E. of Chernigov city. It has flower nurseries, hemp culture, tanneries, tallow and bell-metal foundries, and manufactures of leather and copper ware. Pop. (1897) 12,451.

Star of Bethlehem, or ORNITHOGALUM, a genus of bulbous plants belonging to the order Liliacæ. The flowers are white, and the petals do not fall as the seed ripens, as do those of the scillas. The best-known species is *O. umbellatum*; its flowers are borne in umbel-like corymbs. Occasionally in woods, especially in certain parts of Somersetshire,

the spiked star of Bethlehem, *O. pyrenaicum*, is found; it has long, narrow leaves, which fade early in summer, and bears a long cluster of greenish-white flowers in July. A beautiful species, which, however, generally needs glass protection in Britain, is *O. arabicum*.

Star of India. See ORDERS OF KNIGHTHOOD.

Starokonstantinov, tn., Volhynia gov., W. Russia, 62 m. W. of Berdichev. It has breweries, distilleries, brick fields, tallow foundries, and manufactures of soap, potash, and tobacco. Pop. (1897) 16,527, largely Jews.

Stars, self-luminous bodies in space. About 4,400 are visible to the naked eye in both hemispheres; but the total number it is possible to photograph with long exposures may reach, or surpass, 100,000,000. Their total light is estimated by Professor Newcomb at 680 times that of Vega. Their total heat, judging from experiments by Professor Nichols, does not exceed that derived from a standard candle sixty feet distant. The classification of the stars by magnitude



Star of Bethlehem (*Ornithogalum umbellatum*).

1, Pistil; 2, stamen.

depends upon their apparent brightness, that by spectral quality upon their physical constitution. They may thus be divided into five leading families or types:—(1.) Helium stars, the absorbing layers of which are

composed mainly of helium, hydrogen, oxygen, nitrogen, and magnesium. They are intensely luminous bodies of low mean density. Nearly half of them are close binaries. Most of the stars in Orion are of the helium kind. (2.) Sirian stars are brilliantly white and strongly actinic. They give spectra in which dusky hydrogen bands are prominent, iron lines being faint and fine. More than half the stars belong to the Sirian type. (3.) The sun is the prototype of the next class, which is also very numerous represented. (4.) Antarian stars show a fluted spectrum due to absorption by titanium, in addition to a spectrum of lines resembling that of the sun. They are red or orange, and frequently variable. Antares and Mira Ceti are examples. About 1,000 such objects have been discovered. (5.) Carbon stars are distinguished by deep bands of carbon-absorption, with which are associated dark lines indicating the presence of iron, calcium, and other metals. Numerous bright lines of unknown origin have further been detected by Professor Hale in their photographed spectra. The arresting action of their atmospheres on their blue and violet rays causes them to appear red and faint. The brightest (152 Schjellerup) is of 5.5 magnitude. About 250 carbon stars are known, of which 14 per cent. are variable. The first four star types are connected by close gradations, and are held to be in course of development, each into the next, through the advance of cooling and condensation. The position of carbon stars in the evolutionary scheme is not clear. The spectra of variable stars are rarely of helium or Sirian quality.

The stars differ enormously in size and light power. The giants among them, such as Canopus and Rigel, are thousands of times more luminous than our sun; while others give only a fraction of his light, and an undetermined multitude are sensibly obscure. A few of these are known by their gravitative effects; but they are not, properly speaking, stars. The massiveness of the stars varies less than their luminosity, owing to the circumstance that the most brilliant orbs are the most distended (Newcomb). The parallaxes of about 80 have, so far, proved measurable. They are excessively minute, implying distances needing the great unit of the 'light-year' to express them. Thus, stellar observations are all belated by intervals ranging from $4\frac{1}{2}$ years for a Centauri to 3,000 or 4,000 for outlying objects. Most stars are so nearly fixed that their displacements will be perceptible only after

the lapse of several centuries. Bossert's catalogue of 2,675 proper motions (1896) includes, however, 1,500 which exceed $0''.2$ annually; and an eighth-magnitude star in Pictor describes a yearly arc of $8''.7$. Apparent stellar movements are in part 'peculiar' or individual, in part parallactic—a perspective effect of the sun's translation. Using this latter element as a criterion of the mean distance of bodies of stars, Professor Kapteyn reached the conclusion (anticipated by Monck of Dublin) that, on an average, Sirian are fully twice as remote from us as solar stars. From an analysis of 280 radial velocities, Professor Campbell found the mean rate of stellar movement through space to be twenty-one miles a second. A few stars, however, progress with from five to fourteen times this medium speed; others, particularly those of helium type, are relatively slow-paced. No general plan of sidereal movement is discernible; but in Taurus, Ursa Major, and other parts of the sky, squadrons of stars drift together, swayed by a common impulse. The modes of stellar distribution vary with spectral type. Solar and Antarian stars appear to constitute an immense quasi-globular assemblage, with the sun near its centre. They show none of the preference for the Milky Way that is strongly visible in the Sirian and helium classes. Towards this zone the varieties of bright-line objects are also attracted; so that, as Professor Pickering remarks, a galactic and an extra-galactic world of stars can be distinguished. The combined structure, although of colossal magnitude, is evidently of finite compass. See also **FIXED STARS**.

Stars and Stripes. See **FLAG**.

Star-stone. See **SAPPHIRE**.

Starvation. See **FASTING**.

Starwort. See **STELLARIA**.

Stas, JEAN SERVAYS (1813-91), Belgian chemist, born at Louvain. He worked in Paris with Dumas till 1840, when he was appointed professor of chemistry in the military school at Brussels, a post he held till 1865. He held the office of *commissaire des monnaies* till 1872. Stas's life-work was his masterly revision of the atomic weights. It settled the question that atomic weights are invariable, and disposed of the hypothesis of Prout, that they were integral multiples of the atomic weight of hydrogen. Stas also developed a process of detecting alkaloids which has been of great service in forensic medicine. His *Œuvres Complètes* appeared in 1894. See Mallet's 'Memorial Lecture,' in *Jour. Chem. Soc.* (1893).

Stassfurt, tn., prov. Prussia, 19 m. by rail s. of Magdeburg. The principal product is salt, which is exported in large quantities. Pop. (1900) 20,011.

State. The lofty political conceptions of Socrates, Plato, and Aristotle have had an immense influence upon the history of the state. Aristotle's work is of a far more practical character than that of Plato. But in those days the state was only emerging from the chrysalis stage of the family and the clan. Notwithstanding the increased importance of territorial rights, arising from the development of commerce, the Greek regarded blood and religion as the only binding political ties. His fellow-citizens were those, and those only, who could claim descent from an ancestor common to him and to them. Strangers in blood might be tolerated as helots and slaves, or possibly as resident aliens; they formed no part of the state. As a consequence the Greek conception of the state was that of a minute community. At moments of intense enthusiasm, such as that which preceded the Persian invasion, these little communities sometimes formed a temporary union for defensive purposes. But any attempt at closer solidarity, such as the Athenian hegemony, was regarded with the bitterest jealousy. Plato likens the state to an individual, and makes the organization of his model state approach as nearly as possible to the organization of a human being. With him, therefore, unity is everything. All independent organization which could possibly militate against the complete unity of the state is to be rigidly suppressed. Aristotle lays it down that a state is formed by the union of clans and villages. Hence the complete absorption of the individual in the community, which is so striking a characteristic of Greek political speculation, is explained by the fact that in the patriarchal household the authority of the house-father was supreme. Thus is explained also the unlimited sphere of the state's authority and activity.

To the Romans belongs the credit of having found a practical difference between the household and the state. The early history of Rome strikingly resembles the early history of Athens and Sparta. We find there the same patriarchal basis of theory, the same exclusiveness towards strangers, the same devotion to blood and ancestor worship as the basis of society. But the great revolution with which is connected the name of Servius Tullius marks, far more than the expulsion of the kings, an

epoch-making change. The *comitia centuriata* was a body organized on totally different lines from those of the patriarchal state. It did not exclude any one on the ground of birth. Its members were not grouped together in bodies of kindred. On the other hand, it was no democratic body, either in the ancient or the modern sense. Though it included all free citizens, it gave immense preponderance to wealth, and probably to wealth of a peculiarly stable kind—to land, cattle, and slaves. But the *comitia centuriata* was even more remarkable in its military than in its economic character. It enunciated the essential principle that every free citizen of the state, householder or subordinate, native or immigrant, is bound to serve the state in arms. These were the essential principles of a new type of state—the state founded on military liability and the ownership of property. The new state was capable of infinite expansion, so long as it could find men willing to enroll themselves as citizens and undertake the liability to military service. The old race distinction between the patricians and the plebeians gradually disappeared in politics. The alien blood of the Italian communities found a place in the Roman state; the old Latin federation was replaced by the Roman empire. Citizenship had ceased to be a matter of birth; it had become a matter of allegiance. The new idea was independent of any particular form of government. It began with the patriarchal kings and senate; it suited equally the republican system of co-ordinate magistrates; and it was not even inconsistent with the despotic empire of the Cæsars. Nor did it change until the Cæsars substituted paid professional troops for the citizen armies of the republic. Then, indeed, the conception of citizenship altered. It was no longer military service but military subjection which made the bond of the state.

To the political speculator of the middle ages the universal empire of Rome was the highest ideal of the state. Accordingly he strove to re-create the empire, and more than once succeeded in doing so. The Frank empire (800-888) and the Holy Roman empire (962-1806) were the results of his teaching. The only serious inroad upon Roman imperial theory was made by the growing power of the church, chiefly as concentrated in the pretensions of the Roman see. The object of political speculators was to reconcile the conflicting claims of the two powers; and the solution of the problem usually put forward was

that the pope was to wield the spiritual, the emperor the physical, powers of the universal empire. If they could not agree, there was no real remedy. The feudal state arose as the Frank empire dissolved, and the feudal state was a compromise between patriarchal leadership and military supremacy. Based on custom, supported largely by services which, in fact as well as in name, were free gifts, the feudal state recognized the rights of subjects as well as of rulers. The duty of the ruler was to protect his vassals against invasion and disturbance; the duty of his vassals was to support the ruler loyally in his task. It is formally admitted by the feudal law-books that if a ruler fails in his duty, his vassal may solemnly defy him and dissolve the bond; just as, if the vassal fails in his allegiance, the ruler may deprive him of that fief or benefice which, in theory, the feudal vassal always received from his lord. In this system the husbandmen and the craftsmen, the producers of the community, were left almost out of account, probably because they usually represented a conquered community. The winning of their way to power was the task of modern history. Mediæval ideas of polity rested, therefore, on two great distinctions—the distinction between the spiritual and the secular power in the papacy and the empire, and the distinction between the military classes and the other classes in each community. Two great events were destined to destroy these distinctions. One was the reformation of the 16th century; the other was the development of a world-commerce which, taking its rise in the crusades, expanded rapidly from the time of the discoveries of Vasco da Gama and Columbus. The effects of the growth of commerce made themselves felt, politically, in the movement towards representative government which took place all over Europe in the 12th and 13th centuries. The consequent fall in the value of money compelled the resort to new kinds of taxation, and this resort led to the establishment of representative states-general and parliaments. But in almost every country save England the movement, after a brilliant beginning, received a decided set-back. During the 14th, 15th, and 16th centuries, the English nation, compact and strong, was gradually formed by the habit of political association. Elsewhere in Western Europe the old class divisions survived, and the theory of the dual empire still hung over the field of politics, until it perished in fact

(though a shadow of it long survived) in the Thirty Years' war. It was impossible for a pope to claim authority over countries which considered him as Antichrist. It was necessary to find a substitute for mediæval ideas. The task was taken up with alacrity by the writers of those states which had flung off the yoke of Rome, and even by those who still remained Catholics. Bodin, Grotius, Hobbes, Montesquieu, each in his own way, freed the theory of the state from the trammels of mediævalism. Wherever there existed a definitely recognized community, manifesting obedience to an organized government (which government did not, in fact, obey the directions or acknowledge the authority of any external authority), there was a sovereign state. Forms of government were immaterial, though each writer had his own preference. All states were equal in law, whatever their differences of wealth and strength, because, recognizing no human authority, they were in a condition of nature; and in a condition of nature all men are equal. This doctrine has remained supreme in international politics until our own day. But with regard to the relations of rulers with their subjects, the agreement of the post-reformation publicists disappears. Although the severance of England from Rome at the reformation had been brought about by the king, the principles of the reformation soon led to a desire for free criticism and independence in political as well as in religious matters. This desire found its natural expression in parliament, and, after the desperate struggle of the civil war, resulted in the establishment of constitutional government at the revolution of 1688. In the Netherlands the adoption of Protestant principles had much to do with the establishment of the republic. In Scotland, where parliament, though surviving, had never obtained a very deep hold on national feeling, an entirely new organization for the furtherance of reformation principles was called into existence. But in the Protestant states of Germany the excesses which followed on the adoption of Protestantism roused even ardent reformers like Luther to take the side of authority; whilst in Roman Catholic countries, such as S. Germany, France, and Italy, the hands of authority were apparently strengthened by the movement, and from the period of the reformation may be dated the rise of that absolutism which lasted until the French revolution. It is not, therefore, surprising to find that, just at this very time, the absolutist

theory of the state as the actual property of the ruler found distinguished supporters—e.g. Machiavelli in Italy, and Filmer in England. The 'divine right' theory of monarchy is in truth a curious blend from several distinct sources, in which Roman law, ecclesiastical doctrine, and feudal conceptions are moulded to the advantage of the ruler. But as the popular influence on politics became greater, the old contrast between rulers and ruled gradually disappeared, and reformers began to look upon the machinery of government as a thing to be coveted rather than destroyed. England in the 18th century exhibited a monarch not merely bound by the rules of positive law, but actually exercising his undoubtedly legal prerogatives at the bidding of men who called themselves his servants, but who really were his masters. And when it was perceived that the choice of these servants could be pretty directly influenced by means of popular elections, it was soon realized that, in a round-about way, but without violence or illegality, the majority in a community could really get its wishes carried out. Under the influence of this conception the attitude of the masses towards the state has entirely changed. The desire is now, not to destroy state machinery, but to capture it. Hence the constitutional agitations of the first half of the 19th century have been replaced by the socialist agitations of the latter half. The anti-political thinkers—the nihilists, the anarchists, and the individualists—are decidedly at a discount. So obvious is the path before the reformers that the privileged classes have awakened to their danger, and have organized themselves into opposition. The old opposition to the state as an institution has almost entirely disappeared. It is regarded as a natural organ for the expression of the national will, and the only dispute is as to what are the precise dictates of that will.

See Dante's *De Monarchia*, Machiavelli's *Il Principe* (trans. Ricci, 1903), Bodin's *De Republica*, Montesquieu's *Esprit des Loix* (1892), Filmer's *Patriarcha* (1680), Hobbes's *Leviathan* (1670), Locke's *On Civil Government* (ed. 1889), Bentham's *Fragment on Government* (1823), H. Spencer's *Social Statics* (ed. 1892), Bluntschli's *Theory of the State* (1885), and Pollock's *History of the Science of Politics* (1902).

State and Church. A state church is one established, by acts of the legislature or otherwise, as the church *par excellence* of the nation. It receives official recognition from, and officially recog-

nizes in return, the head of the state. It also receives, directly or indirectly, endowment from the state, but is not necessarily under state control. Christianity was first made the state religion by Constantine the Great, emperor of Byzantium, in the 4th century. For the subsequent history of the connection, see CHURCH and PAPACY.

Staten Island, a lofty rocky island off the S.E. extremity of Tierra del Fuego, from which it is separated by Le Maire Strait. It has a lighthouse at its eastern end.

States-general, the representatives of the three estates in France — nobility, clergy, and burghers. They seem to have been first summoned in 1302 by Philip the Handsome; but their sole function was to give sanction to measures imposing general taxation. They had no legislative function, and only by petition could they affect the course of public affairs; moreover, they were very seldom summoned. When in 1614 Louis XIII. summoned them, they displayed such an interest in the finances of the country that he hastened to dismiss them. They did not meet again till the revolution of 1789; and then they transformed themselves, at the invitation of the third estate or burghers, who were as numerous as the other two put together, into a National Assembly (June 17). The name is also applied to the representative body elected by the seven united provinces of the Netherlands, a body which continued to meet at the Hague till the French conquest (1593-1795). It was of a federal character, voting being by provinces.

States of the Church. See CHURCH, STATES OF THE.

States' Rights, a political doctrine which has played a large part in the history of the United States. It declares that the ultimate sovereignty and seat of power is lodged in the separate and individual states, which for certain definite purposes agreed to act in common, and created for that purpose a central government, whose powers are strictly limited, and include only such matters as are expressly delegated to it. All other authority and every other function, whether specified or not, belongs to the individual states. For instance, President Cleveland was criticised for employing federal troops during the Chicago strike; but even this much he could not do till the mails were in danger. The principle logically involves the right of secession, and it required the civil war of 1862-4 to formulate a decided negative to that proposition. The mainte-

nance of the union was as great an object with Northern statesmen as the abolition of slavery. The doctrine still survives, however, as part of the traditional aims of the Democratic party. See Bryce's *American Commonwealth* (3rd ed. 1893-5).



Statice Limonium.

1, Single flower; 2, section.

Statice, a genus of herbaceous and shrubby plants, belonging to the order Plumbaginaceæ. They are mostly of Asiatic origin, though the sea lavender (*S. Limonium*) is a native British plant, being fairly common in certain parts of the coast. It has broad, oblong leaves, and in late summer bears spikelike clusters of scentless flowers. Other British species of less frequent occurrence are *S. spathulata*, the spatulate sea lavender, and *S. reticulata*, the netted sea lavender. The flowers of the sea lavenders usually consist of a funnel-shaped calyx, of a corolla five-cleft nearly to the base, and of five stamens and carpels. The hardy species are easily grown in ordinary garden soil; the greenhouse kinds require a light, sandy, fibrous loam. They are largely grown as cut-flower plants.

Statics, the branch of dynamics which deals with the equilibrium of bodies and systems of bodies. As usually developed, it is based upon the fundamental theorems of the balancing of forces. In order that the forces acting on a system should produce equilibrium, it is necessary that there should be no tend-

ency to translational and rotational motion. If then the system be supposed to suffer small displacements consistent with the geometrical conditions of constraint, and if the work done during these small displacements against the forces be estimated by multiplying each force by the displacement in its direction of the point of its application, and then adding all the products together, the sum so obtained ought to vanish. This is the principle of virtual velocities or virtual displacements which Lagrange made the basis of his *Mécanique Analytique* (1788). It is really fundamentally equivalent to the principle of the minimum potential energy. For special types of problems other methods of attack lead more easily to the solution. For example, equilibrium requires that the sum of the moments of all the forces about each and every axis must vanish. This method may apparently not be immediately applicable when, as is often the case, the forces are not all completely specified. But in such cases there are always other conditions given, which, with the statical conditions of equilibrium, lead to the complete determination of the position of equilibrium and of the non-specified forces. For example, to find the position of a hemisphere resting on two smooth inclined planes, the only force given is the weight of the hemisphere acting through its known centre of gravity. The inclinations of the planes give the *directions* of the pressures on the planes; and since these two pressures known in direction must balance the known weight acting vertically, the values of the pressures are practically known. The equation of the vanishing resultant moment about any convenient point will give the positions of contact of the hemisphere and the planes. Problems of this kind are readily solved by use of graphical methods, aided by calculation. (See GRAPHICAL STATICS.) It is usual in most treatises to discuss attractions as a branch of statics, simply because the mathematics is of the same kind—*viz.* the calculation of the resultant of a number of forces. If under the action of this resultant force the particle begins to move, the problem ceases to be statical. Another important branch of statics is that which deals with the equilibrium of a strained solid. (See ELASTICITY.) The best known English treatises on statics are those by Todhunter, Routh, and Minchin. Jellet's treatise on *Friction* has many excellent points.

Stationers' Company. The charter of this company was granted in 1556. For many years

printers and books had to be licensed by the Stationers' Company, to which was delegated the censorship of the press. But now, under the Copyright Act, 1842, registration at Stationers' Hall is only necessary to enable the owner of literary copyright to bring an action for infringement. See COPYRIGHT.

Stationery Office, an establishment in London formed by the government in 1786 to provide stationery, books, pens and ink, etc., to the various government offices. Its chief function, however, at the present time, is to arrange for contracts to print the parliamentary sessional and other papers.

Stations. (1.) The weekly fasts on Wednesdays and Fridays. These were called stationery days. (2.) Churches in which indulgences are granted on special days, in the Church of Rome. A 'station' also signifies the ceremonial procession of clergy and choir from the church to a tomb or other hallowed place. (3.) A picture or carving placed in a church, in commemoration of the stages of our Lord's passion, and before which devotional exercises are practised. They are—(1) Our Lord's condemnation; (2) bearing the cross; (3) falling under the cross; (4) meeting the Virgin; (5) the Cyrenian; (6) Veronica; (7) Christ falling; (8) consoling the daughters of Jerusalem; (9) falling; (10) stripped; (11) His crucifixion; (12) His death; (13) the descent from the cross; (14) in the grave.

Stations, RAILWAY. See RAILWAYS.

Statira, the sister (and wife) of Darius III. (Codomannus), the last king of the ancient Persian dynasty, who was captured by Alexander the Great after the battle of Issus (333 B.C.). She died shortly after the battle of Arbela, two years later.

Statistics, the study of social facts in so far as these can be counted or enumerated; though some writers would include all arithmetical investigation or arrangement of facts. In this work there are three stages—(1) Collection; (2) analysis; (3) comparison. The collection of statistics is an expensive matter, and is undertaken chiefly by governmental and quasi-governmental agencies, though occasionally individuals, such as Mr. Booth and Mr. Rowntree, undertake the task. Governments collect statistics of trade to facilitate the collection of revenue. They collect statistics of crime in the ordinary course of judicial procedure. They collect vital statistics to prevent crime, to facilitate the transference of property, and to make the foundations of

social life secure. In some cases governments count social facts that are not susceptible of exact estimates. The United States census is a case in point. The collection of statistics may be according to one of two methods—(1) periodical enumeration, of which the census is the best instance; and (2) continuous registration, as of births, marriages, and deaths. Registration is the method employed when the date of occurrence is almost as important as the fact. The mere figures collected are of little value. They are simply the raw material, and need to be worked up. But unfortunately statistics are frequently analyzed and manipulated to establish some foregone conclusion rather than to elicit or illustrate a truth. Comparison of statistics, into which the question of average generally enters, may be according to time, comparing wages or prices or population in the 19th century with wages, etc., in other centuries. Or it may be according to place, as when we compare birth-rates of France and Germany; or according to social conditions, as when we compare the income of different classes or trades. Comparison, however, is a very dangerous operation because of the complexity of social phenomena. See Bowley's *Statistics* (1902), Mayo Smith's *Statistics and Economics* (1886) and *Statistics and Sociology* (1894), Keynes's *Scope and Method of Political Economy* (1891), and Mulhall's *Dict. of Statistics* (4th ed. 1899).

Statius, PUBLIUS PAPINIUS (c. 61-98 A.D.), Roman epic poet, patronized by Domitian. He is said to have retired to Naples and to have died there. Of his works there are extant *Thebais*, an epic poem on the war of the Seven against Thebes; *Achilleis*, an incomplete work on Achilles; and *Silva*, thirty-two poems on various subjects. Statius is a poet of learning and art, not of inspiration; his style is brilliant and elaborate, even to obscurity; his versification is correct, though he lacks all the higher qualities of poetry; and his epics, though famous in their day, are tedious to modern readers. The *Silva* are more interesting. Editions: Text, by Lemaire (1825-30) and by Garrod (1906); *Thebais*, by Kohlmann (1844); *Achilleis*, by Kohlmann (1879); *Silva*, by Baehrens (1876); English verse trans. of *Thebais* by Lewis (1773); bk. i. by Pope.

Statuary. See SCULPTURE.
Statute. See Act of Parliament, under ACT.

Statute Law Revision. In England statutes are in force till repealed, though in Scotland

acts passed before the union may be held to have fallen into desuetude. The large number of obsolete statutes encumbering the statute book led to the appointment of the Statute Law Revision Committee in 1859, and Statute Law Revision acts have been passed every few years since 1861. Since 1863 these acts have been prepared by the Statute Law Committee appointed in that year. They have dealt with the revision of English acts before the union with Scotland, Irish acts before the union with England, and acts of the Parliament of Great Britain. It is also intended to revise in a similar way the acts of the Scottish Parliament before the union. The acts or parts of the acts repealed by the Statute Law Revision Acts are of six kinds—(1) acts which operated for a time but have now expired; (2) spent acts, or acts which have performed their work; (3) acts already repealed by general words; (4) acts virtually repealed by later acts inconsistent with them; (5) superseded acts; (6) obsolete acts. Preambles which are not necessary for purposes of explanation or interesting historically are also repealed, but the repeal is not to affect the construction of the acts.

Statute Merchant. By the Statutes of Merchants, 1286 and 1288, a merchant who wished to be sure of his debt summoned the debtor before the mayor, and the debtor entered into a recognizance undertaking to pay on a certain day. A copy of the record, sealed with the king's seal, was called a statute merchant. On failure to pay, the merchant could forthwith distrain. See Reeves's *English Law*, ii. 71.

Statute of Frauds. See FRAUDS, STATUTE OF.

Statute of the Staple. This statute (1354) enacted that the sale of wool, leather, woollens, and lead made in England should be held at certain staple towns. Foreign merchants resorted thither, and no Englishman might take goods out of the kingdom. The mayor and constables administered the law merchant within the staple. There was a summary method of recovering debts, called the statute staple. See Reeves's *English Law*, ii. 277.

Statuto, the constitution granted to Piedmont and Savoy by Charles Albert in 1848; it was afterwards extended to the whole kingdom of Italy, and is still in force. Copied mainly from the American constitution and from the French of 1830, it has the same defects, especially in the separation of the executive and legislature.

Staubbach, celebrated waterfall (980 ft.), in s. of Canton Bern, Switzerland, 8 m. s. of Interlaken.

Staunton, city, Virginia, U.S.A., Augusta co., in Shenandoah valley, 100 m. N.W. of Richmond; the seat of Washington and Lee University. Pop. (1900) 7,289.

Staunton, HOWARD (1810-74), chess-player and Shakespearean commentator, was almost entirely self-educated. He early acquired a reputation as a chess-player, and in 1843 beat St. Amant, the champion of Europe, and for nearly ten years was unbeaten. He utilized his chess knowledge to conduct newspapers devoted to chess, and chess columns in other newspapers, and to write various handbooks on the game. From 1854 he devoted much attention to the study of Shakespeare, and in 1857-60 issued an edition with notes showing sound scholarship and sound sense.

Staurolite, an aluminium, magnesium, and ferrous silicate, which crystallizes in the rhombic system, usually in twinned crystals. It is brown in colour, with vitreous lustre, and is often filled with minute enclosures of other minerals (sp. gr. 3.4-3.8; h. = 7-7.5). It is found principally in metamorphic rocks, such as gneiss and mica-schist, and fine crystals are obtained from the St. Gothard, Tyrol, and Brittany.

Stavanger, tn., in co. of same name, W. coast of Norway, on a s. arm of Bukken Fiord. The seat of a bishopric till 1685, its cathedral (12th-13th century) is in the Norman style, restored 1866. Navigation and fishing are the chief occupations. Pop. (1900) 30,541.

Stave. See MUSIC.

Stavesacre. See DELPHINIUM.

Stavropol. (1.) Russian gov. N. of the Caucasus, embraces the Stavropol highlands and the valleys of the upper Kuma and Kalais. Cossacks form the bulk of the population. Area, 23,398 sq. m. Pop. (1897) 876,298. (2.) Chief tn. of above, 147 m. E. of Yekaterinodar; with flour mills and gardening. Pop. (1897) 46,965.

Stawell, bor., co. Borung, Victoria, Australia, with a school of mines, gold-mining, and freestone quarries. Pop. (1901) 5,296.

Stawell, SIR WILLIAM FOSTER (1815-89), was born in Co. Cork, Ireland, and called to the Irish bar in 1839. He emigrated to Australia (1842), and acquired a large legal practice. He advocated the separation of Victoria from New South Wales, and became first attorney-general in the colony (1851). On the grant of

responsible government he held the same office under the new conditions (1855). In 1857 he became chief-justice of Victoria, and in 1859 was knighted.

Stays, ropes which support a mast by extending from it to the midship longitudinal section of a ship's hull in a fore-and-aft plane. They take their names from the masts to which they are attached. A ship is said to be 'in stays' when her head is dead on to the wind, and the sails are loose while she is going about. To 'miss stays' is to fail to come up in the direction of the wind, so as to get on the other tack.

Stead, WILLIAM THOMAS (1849), English journalist, was born at Embleton, Northumberland; was appointed editor of the *Northern Echo*, Darlington, in 1871, and in 1880 assistant-editor of the *Pall Mall Gazette*. Three years later he succeeded to the editorial chair. He was the first to introduce the interview into the English press, and thus founded what became known as the 'new journalism.' A great sensation was created by his series of articles, 'The Maiden Tribute to Modern Babylon' (July 1885). A sentence of three months' imprisonment upon Mr. Stead and the passing of the Criminal Law Amendment Act, 1885, were two incidents arising out of this. In 1890 he started the *Review of Reviews*, a monthly magazine which has achieved a great success. He also founded the *American Review of Reviews* (1891), the *Australasian Review of Reviews* (1894), and the 'Masterpiece' Library of Penny Poets, Novels, and Classics (1895). He published from 1893 to 1897 *Borderland*, a periodical devoted to the subject of psychical research; and in January 1904 the *Daily Paper*, which was, however, discontinued after a brief existence. His publications, either in book form or as *Pall Mall Gazette* 'extras,' include *The Truth about the Navy* (1884); *The Truth about Russia* (1888); *The Pope and the New Era* (1889); *If Christ came to Chicago* (1893); *Satan's Invisible World—A Study of Despairing Democracy* (1897); and, in French, *The Conference at the Hague*, as well as many pamphlets against the South African war.

Steak, TWO-EYED, a nickname for the herring when cooked or cured.

Stealing. See LARCENY and THEFT.

Steam, the transparent, colourless gas into which water is converted when it vaporizes. This change takes place quietly and by evaporation from the surface if the vapour pressure is below the external pressure; thus at the temperature of melting ice

(0° c.) the vapour pressure is only 4 mm. of mercury ('077 lb. per sq. in.), but it increases with rise of temperature, till at 100° c. (212° f.) it becomes equal to 760 mm. of mercury (14.7 lbs. per sq. in.). If the external pressure is that of the atmosphere, it will be approximately equal to this amount, and with the slightest excess of the vapour pressure over it the change of the water into steam occurs rapidly and with ebullition. If the external pressure is greater than that of the atmosphere, as in a steam boiler, boiling does not occur till the water is at a much higher temperature; for example, in a boiler giving steam at 250 lbs. per sq. in. the temperature of the water is approximately 205° c. (401° f.) instead of 100° c. Steam under these conditions in the presence of water is called saturated steam, and is of a definite density for each pressure. This density is the greatest that steam can possess under the given pressure, and also corresponds to a particular temperature, fall of temperature producing a fall of pressure and condensation of some of the steam, while rise of temperature produces the converse effect, the pressure increasing much more rapidly than the temperature. Observations of the relation between the two were very carefully made by Regnault, and the results tabulated, though in the absence of the tables they may be calculated from the equation given by Rankine: log

$p = A - \frac{B}{T} - \frac{C}{T^2}$ where p is the pressure and T the absolute temperature; and for pounds on the square inch and degrees of the Fahrenheit size, $A = 6.1007$, $\log B = 3.43642$, $\log C = 5.59873$. If the pressure is required in inches of mercury, $A = 6.4095$, while for centigrade degrees $\log B = 3.18115$ and $\log C = 5.08819$. The absolute temperature in Fahrenheit degrees is found by adding 461.2 to the temperature F , and in centigrade degrees by adding 273 to the temperature C .

If steam is heated away from water, it is said to be 'superheated,' and then obeys the ordinary laws governing the expansion of gases. The quantity of heat required to bring about the change of state from water to steam changes with the temperature at which evaporation takes place, about 600 calories being required to evaporate 1 gram at 0° c., 536 calories at 100° c. (1,146 B.T.U. to evaporate 1 lb. at 212° f.), thereafter diminishing, till at 200° c. it is reduced to about 470 calories. This falling off may be calculated from the expression $L = (\text{heat required to convert water into steam at } t^{\circ} \text{ C.}) - 606$

- 7*t*; but this probably only holds good for moderate temperatures, as water reaches its critical point, at which the difference between liquid and vapour cannot be distinguished, at a temperature of 365° C. To heat the steam itself requires '481 calorie per gram per degree C.' ('481 B.T.U. per lb. per degree F.) at constant pressure and '346 calorie at constant volume. In this way, though the total amount of heat required to generate steam increases as the temperature at which it is required rises, yet owing to the falling off in the heat of vaporization the difference is but small, and for use in steam-engines is overbalanced by the increased economy due to the higher working temperature.

Steam naturally occupies a very much larger volume than the water it is obtained from: thus 1 volume of water at ordinary temperature produces about 1,700 volumes of steam at 100° C. The vapour is lighter than air at the same temperature, and, contrary to the common idea, is invisible; the white cloud seen issuing from a steam-pipe, and usually called 'steam,' is in reality a fog of minute liquid particles produced by condensation.

Besides its commonest use as the working substance in engines, steam is also largely employed for heating, its large latent heat being restored on condensation, for introducing moisture in various operations, and for disinfection; thus saturation of clothing, etc., with steam under slight pressure is very effective in that respect. Steam is also an excellent fire-extinguisher if the fire is burning in an enclosed space, such as a compartment in a ship's hold, which can be effectually filled with steam.

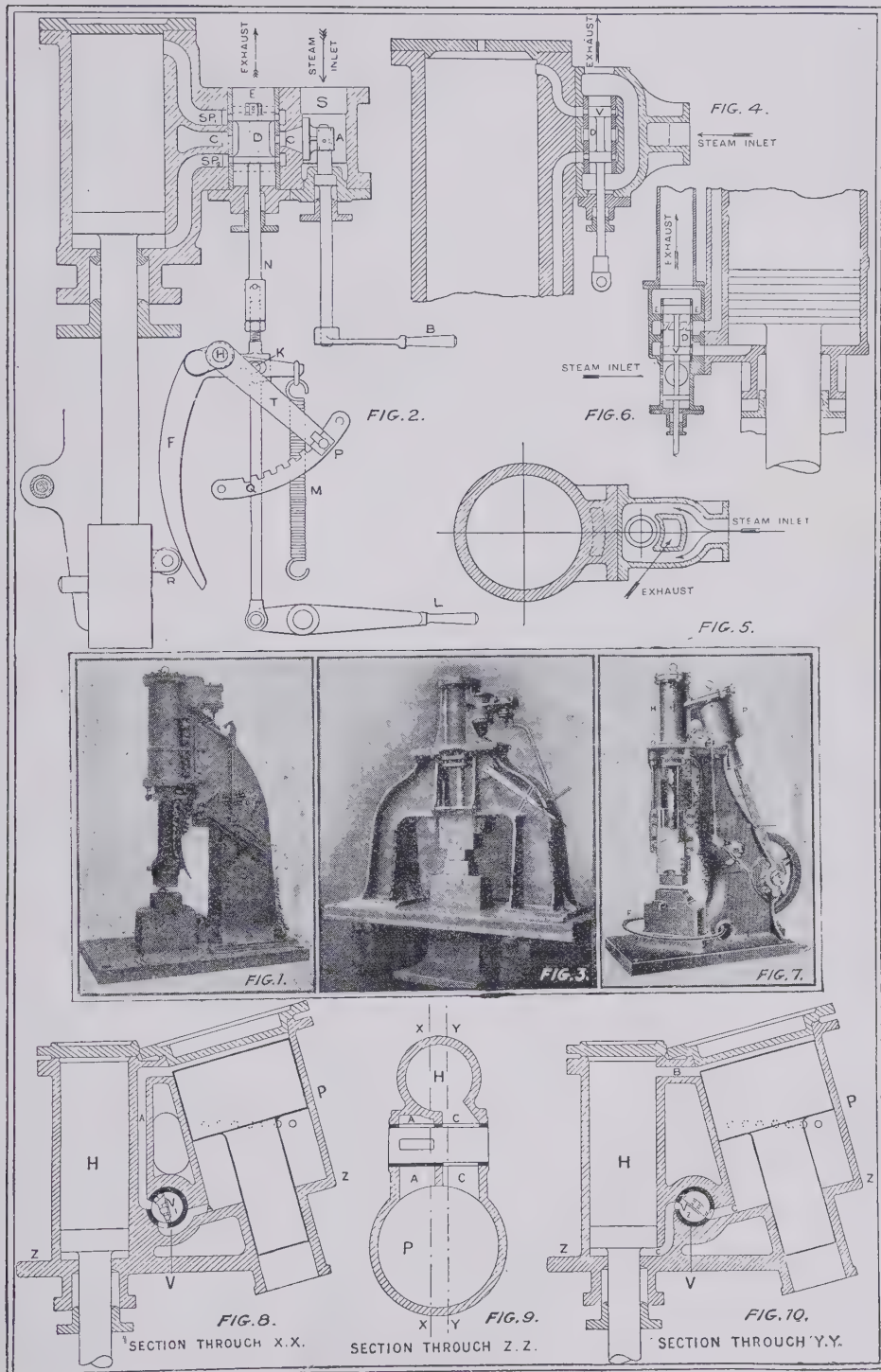
Steam and Power Hammers. It would appear that a steam-hammer was patented by James Watt in 1784, and also by William Deverell in 1806; but no record exists of a hammer ever having been constructed by either. The full credit of making the steam-hammer a practical and workable machine is entirely due to James Nasmyth of Manchester, who designed one in 1839, though he did not actually construct it then. During a visit to France in the early part of 1842, Nasmyth was surprised to find a steam-hammer, which had been made according to his original design, at work in Creusot. This discovery led him to patent his invention, and in 1842 he constructed his first direct-action steam-hammer. Nasmyth's first hammer was very similar in general design to the steam-hammers now in use; it has been modified and improved in minor details, but the principle of action

remains the same. The original hammer consisted of a base plate with a central opening, through which the top of the angle projected. Two cast-iron standards, supporting an overhead inverted steam cylinder, were bolted to the base plate, and also formed guides to direct the motion of the hammer head or tup, which was directly connected to the piston rod. The admission of the steam—to the underside only of the piston—was effected through a simple slide-valve operated by suitable levers. The energy of the blow delivered by the tup was determined by the height through which it fell before impact. This height could be regulated, within the limits of the full stroke of the piston, by means of the slide valve. On the down stroke the steam below the piston was allowed to escape freely into the air. Later, in order to increase the blow given by the hammer, Nasmyth made it double-acting, steam being admitted to the top of the piston, thereby considerably accelerating the downward motion of the tup. The blow delivered by the tup of a steam-hammer can be regulated with the utmost nicety both as to speed and to force; the hammer can be stopped and started instantly, and made to deliver a rapid succession of sharp blows or the slow thud of a mass weighing many tons. It is usual to indicate the size of a hammer by the weight of the falling mass, including the tup, piston rod, and piston. Thus a 10-cwt. hammer is one in which the moving mass is 10 cwt. No account is taken of the pressure of the steam acting on the top of the piston, which naturally will greatly increase the force of the blow. In order to estimate the force of a blow delivered by a falling weight, it is necessary to know the velocity at which it reaches the object struck, and either the depth of the impression made or the time required to absorb the energy stored up in the moving mass at the instant of impact must be known. Materials vary very much with regard to the amount of resistance which they offer to deformation, and consequently it is difficult to arrive at any accurate data as to the force of a blow. Messrs. B. and S. Massey state that the maximum blow of a 5-cwt. double-acting steam-hammer with moderate steam pressure—about 40 lbs. per sq. in.—produces a crushing effect upon a piece of hot iron equivalent to a statical load of about 30 tons. With a harder material, the amount of deformation being less, the intensity of the blow would be much greater.

A very convenient form of steam-hammer suitable for small

and medium sized smith-work, and built by Messrs. B. and S. Massey, is shown in Fig. 1. It is fitted with a combined self-acting and hand-worked valve gear. With the former gear the hammer can be set to give continuous blows, quick or slow, light or heavy, for as long as the starting valve is kept open. Also single dead blows can be struck at any instant. The 10-cwt. size has a cylinder 13 in. in diameter, with a stroke of 27 in. The anvil block passes through the base plate and rests upon pitch-pine barks laid on the top of a stone or concrete foundation. There is a flat on the piston rod to prevent the tup from turning round. The valve gear for operating this hammer is shown separately in Fig. 2, the cylinder and valve chest being in section. Steam enters at S, and a starting valve A, which is opened by a horizontal movement of a handle B, admits steam to a middle port C. The regulating valve D is of the piston type, and by moving this valve up or down—the dotted lines indicate the extreme positions of the valve—steam can pass from the middle port C into the upper or lower port respectively. On the up stroke the exhaust steam from the upper end of the cylinder passes through the port SP and out at E; the valve D is made hollow so as to permit the exhaust steam from the under side of the piston to escape through it. The valve gear is self-acting, but it can also be worked by hand through the handle L; by moving this handle up or down the valve D is brought into its lower or upper position respectively, and the piston rises or descends under the action of the steam. The self-acting motion is obtained through a curved lever F working about a movable fulcrum H, and kept in contact with a roller R on the tup by means of a spring M attached to the end of the short arm of the lever. As the tup ascends the lever F is moved to the right, and the valve spindle N lifted by a pin K connected to the short arm of the lever; the valve D is thus placed in a position to allow steam to enter the upper port and bring the piston down again. The length of the piston's stroke can be regulated by varying the position of the fulcrum H; this is effected through a sector lever T. The extreme positions P and Q of the lever T obtain for the piston its longest and shortest strokes respectively. The lever L is not used when the hammer is working self-acting. To give a dead blow this lever is pressed down.

A double-column hammer for heavy forging work, shingling, etc., as made by Messrs. R. G.



Steam and Power Hammers.
(For explanation, see text.)

Ross and Son, is shown in Fig. 3. Valve gear worked by hand or self-acting is fitted as required. Fig. 4 is a vertical and Fig. 5 a transverse section through the cylinder and valve casing. The piston valve *v* is formed of two solid discs, and the steam is admitted into the space *D* between them. The method of working is practically the same as already described. Fig. 6 is a section through the valve casing of a hammer fitted with a valve *v* provided with three pistons. To raise the hammer piston the valve is moved upwards, and the steam is admitted to the under side of the piston. When the latter has reached its top position, the valve is moved downwards, shutting off the main steam supply, and putting both sides of the piston into communication through the ports and the space *D*. Although the

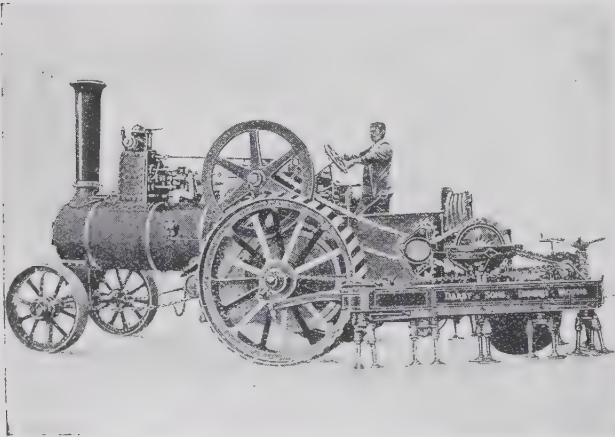
from an inclined pump cylinder *P*, which is placed behind the hammer cylinder *H*. The pump cylinder is provided with a piston, worked from a crank at the back of the standard, and the crank shaft may be driven either by a belt or by an electric motor. The hammer and pump cylinders are connected at their upper and lower ends by passages *B* and *C* respectively; a third passage *A* connects the top and bottom of the pump cylinder. The passage *C* and the lower part of the passage *A* are arranged side by side so that they pass through opposite ends of a valve chamber, in which there is a valve *v* divided into two parts in such a way that one part controls the passage *C* and the other part the passage *A*. The valve *v* is provided with two one-way air valves *v*₁ and *v*₂ attached to it, each consisting of a

the passage *A* is fully open (Fig. 8). As the pump piston reciprocates, the air passes freely from top to bottom, and *vice versa*, without in any way affecting the hammer cylinder. On either lever being still further depressed, the valve *v* gradually closes the passage *A*, thus preventing, to a greater or less extent, the air from circulating, and the pump forces air alternately above and below the hammer piston, setting the hammer into motion. The further the lever is depressed the heavier is the blow, and when the third position is reached the maximum blow is given. Thus heavy or light blows, with long or short strokes, can be struck at will, the regulation being easy, accurate, and instantaneous. As soon as the lever is released the tup rises to the top of its stroke and remains there. When the lever is in the lowest position, the one-way valves again come into operation, and bring about an action which is the reverse of what happens when in the top position. A partial vacuum is formed below the hammer piston, and the tup is held firmly down on the anvil, enabling the hammer to be used as a vice. For very heavy forgings—armour plates, large crank shafts, etc.—the steam-hammer is replaced by hydraulic presses. With this apparatus a gradual increase of pressure is obtained as the substance under treatment becomes more compact, thus avoiding waste of energy.

Steam-chest. (1.) Of an engine, the chamber in which the valve works which admits steam to the cylinder. (2.) In calico printing, a tank in which cloths are steamed to fix their colours.

Steam-digger, an implement for cultivating the land, in substitution for ploughing and the subsequent processes of harrowing, etc. Its object is to simulate as far as possible the action of digging by hand. The Darby steam-digger was first exhibited at Carlisle in 1880. This was, in effect, a light traction-engine, capable of being moved forward on the road or, when required, with a broadside motion on the fields. Power was communicated by spur gearing to a horizontal shaft parallel to the boiler, and from this to the cranks of six digging-forks, to which was given an alternating motion by means of pinions. The implement covered a breadth of 20 ft. on each journey, the area cultivated, to a maximum depth of 14 in., being about an acre an hour.

The most recent type of Darby digger is a separate V-shaped implement, drawn behind an ordinary traction-engine of from six to eight horse-power. This carries ten pairs of horizontally revol-



The Darby Steam-digger, with Traction-engine.

pressure per square inch is the same on both sides of the piston, the total downward pressure will be in excess of the total upward pressure, because the effective area of the lower face of the piston is much less than the area of the upper face; the force of the blow is thus augmented. When the valve is in its top position, the exhaust steam from above the piston escapes through the top ring of holes *E*. Compressed air is sometimes used instead of steam as the motive power for hammers.

Pneumatic Power Hammer.—A general view of a 7-cwt. hammer of this type, made by Messrs. B. and S. Massey, is illustrated in Fig. 7. Sections through the cylinders are given in Figs. 8, 9, and 10. In general design it is similar to an ordinary steam-hammer, except that it is worked by compressed air, supplied alternately above and below the hammer piston

thin steel disc and a light spring. The passages *C* and *A* themselves have no communication with one another, but are controlled by the same valve, which can be rotated by means of a hand-lever *L*, or a foot-lever *F*, into four different positions corresponding to the notches in the quadrant in connection with the hand-lever *L*. This hand-lever is arranged to work independently of the foot-lever. In the top position of these levers the one-way valves *v*₁ and *v*₂ come into operation, and the air is allowed to pass down the passage *A* on the up stroke of the pump, and along the passage *C* into the hammer cylinder on the down stroke, but not in the opposite direction; thus the lower part of the hammer cylinder is filled with compressed air, and the tup held up at the top of its stroke. When the levers are depressed into the second position

ing cutters which pulverize the soil to a maximum depth of ten inches. The cutters may be lifted up so as to penetrate only slightly, or they may be withdrawn entirely from the ground for travelling from field to field. The outside cutters are hinged to turn inwards, so that the normal width of twelve feet can be reduced to nine feet for passing through gates. This implement cultivates about three quarters of an acre per hour, when working at its maximum depth, at a total cost not exceeding ten shillings per acre.

Steam-engine. The steam-engine, in its many forms, is the agent by means of which part of the kinetic or active energy stored up in the steam, as supplied by a boiler, is converted into mechanical or useful work. It is well known that Hero of Alexandria (120 B.C.) used steam to drive a kind of steam-turbine; also that the Italian engineer Branca (1629) made a wheel to rotate by means of a jet of steam which impinged on vanes set on its rim. These, however, were not much more than toys, and it was not until the time of Worcester, Savery, Papin, Newcomen, and Watt that the energy of steam was applied to any useful purpose.

The earlier steam-engines were used almost entirely for pumping water from mines. Savery's engine (1698) was the first practical steam-engine, and consisted of two egg-shaped vessels of equal size, the upper and lower ends of which could be connected alternately, with a boiler, and with a pipe leading to a well, respectively. One of the vessels having been filled with steam, communication with the boiler was shut off, and the steam condensed by the cooling action of a jet of water on the outside of the vessel. This resulted in a partial vacuum being formed, and water was forced by the pressure of the atmosphere from the well into the vessel. Fresh steam was then admitted, and the water forced by it from the vessel to a tank at some higher level. This action went on alternately in the two vessels; while one was filling the other was being emptied. This engine has a modern representative in the pulsometer, in which the principle of action is practically the same as in its prototype, but greatly improved, especially as regards fuel consumption.

The first steam-engine with cylinder and piston was no doubt the invention of Denis Papin (1690), who suggested that a vacuum could be formed under a piston by the condensation of steam previously used for raising the piston. Fifteen years later

Papin devised a modified form of his first engine, consisting of a displacement chamber or cylinder with a diaphragm or piston floating on the top of the water. When communication was made with the boiler, steam acted upon the upper surface of the diaphragm, pressing it down and forcing the water through a pipe fitted with a non-return valve into a vessel at a higher elevation. At the conclusion of a working stroke (down) the steam was allowed to escape through a cock, and more water was admitted from the source of supply, bringing the piston to its top position again, ready for the next down stroke. Papin's second engine can hardly be looked upon as an improvement on his first, as it had many of the defects of Savery's engine, while the first was, without doubt, an atmospheric engine, afterwards elaborated by Newcomen and Watt. Papin also introduced a mass of hot metal into a recess in the top of the piston, with the object of keeping the steam dry. He also invented a boiler with an internal fire-box, a type which is now almost universally used.

Newcomen, in conjunction with Savery and Cawley (1705), made the piston engine a practical machine. Newcomen's was an atmospheric engine; in this type the piston is forced down by the pressure of the atmosphere, a partial vacuum having been previously formed within the cylinder. Newcomen's engine consisted of a vertical cylinder, open at the top and placed above the boiler. The piston was connected by a chain with one end of an overhead rocking beam, the opposite end of the beam having a long pump rod hung from it, also a heavy weight or counterpoise to bring the piston to the top of its stroke when steam was admitted into the cylinder from the boiler. Steam was then shut off, and a jet of cold water allowed to enter the cylinder, condensing the steam and producing a partial vacuum. The pressure of the atmosphere acting on the upper face of the piston forced it down and lifted the pump-rod at the other end of the beam. About 1711 Newcomen's engine began to be introduced for pumping water out of mines.

In 1763 James Watt was engaged in repairing a model of Newcomen's engine belonging to Glasgow University, and from this date the true development of the steam-engine may be said to have begun. Watt saw that it was absolutely essential that the cylinder should be kept as hot as possible to prevent undue loss of steam, and that all condensation must take place in a vessel separ-

rate from the cylinder. To deal with the various inventions and improvements made in the steam-engine by James Watt is beyond the scope of this article, which is meant rather to describe the construction and general design of a few of the more important and best types of the modern steam-engine.

The direct-acting steam-engine (Fig. 1) is the simplest form, and consists of a cast-iron cylinder C, here shown in section, and fitted with a piston P, which is made steam-tight by means of expandable rings R. The piston is connected to the crank D through a piston rod PR and a connecting rod CR. The reciprocating motion of the piston is thus converted into a rotary motion of the crank shaft. The piston is made to move to and fro in the cylinder by the action of the steam, which is admitted alternately to the opposite ends of the cylinder through ports SS. The face of the piston, other to that on which the driving pressure is acting, is for the greater part of the stroke in communication with the exhaust port EP. The steam enters and leaves the cylinder through the steam ports, and is discharged into the atmosphere (non-condensing engine), or into a condenser (condensing engine) through the exhaust port.

Slide Valve.—The admission of the steam and its discharge after it has effected its purpose is determined by a slide valve SV, which is made to travel to and fro across the port openings by the action of an eccentric E keyed to the crank shaft CS. The pressure of the steam acting on the back of the valve keeps it in steam-tight contact with the working face of the cylinder. The cavity F in the centre of the valve permits either steam port to communicate with the exhaust port. The amount by which the slide valve overlaps the outer and inner edges respectively of each steam port when in mid position (Fig. 2) is called the 'outside' or 'steam lap' O, and the 'inside' or 'exhaust lap' I. The object of the outside lap is to cut off the steam before the piston has reached the end of a stroke, so as to take advantage of the expansive energy of the steam, and thus to work much more economically than if the steam were admitted throughout the entire stroke. The inside lap acts in the same way with regard to the steam leaving the cylinder—a certain portion of the exhaust steam is retained and compressed by the piston, forming an elastic cushion, which assists in bringing the piston, etc., to rest without shock at the end of each stroke. The steam ports begin to open for the admission of steam just before the piston

reaches the end of each stroke, so that at the commencement of a stroke the port is open by a small amount, which is called the 'lead.' The dotted lines show the valve in this position. Admitting steam on the exhaust side just before the end of the stroke completes the compression action, and the lead enables the full pressure to be brought to bear on the piston at the commencement of each working stroke. Towards the end of the expansion or working stroke the slide valve is in such a position that the steam can escape through the cavity *F* into the exhaust port *EP*. This point is called the 'release.' The driving pressure is thus relieved, and at the commencement of the return stroke, owing to the further motion of the valve, there is ample opening for the exhaust steam to pass out of the cylinder without producing undue back pressure. A delayed release causes excessive back pressure, and reduces the effective driving pressure on the piston. The respective positions of the slide valve (in section) and piston with reference to the steam and exhaust ports at the beginning of a stroke, cut-off, release, and compression, are shown in Fig. 3. The arrows indicate the direction in which the slide valve and piston are moving for each position. The corresponding positions are also shown on a hypothetical indicator diagram (Fig. 4). The cut-off, release, etc., do not occur at the same points on the forward and return strokes respectively, because the obliquity of the connecting rod to the line of stroke causes the piston to be more advanced in the one stroke and less advanced in the other than it should be to correspond exactly with the crank's position. A single slide valve is not suitable for a cut-off earlier than half-stroke, because with it the period of expansion is equal to the period of compression, and it is desirable that under certain circumstances the latter should be independent of the former. Consequently many engines have two sets of valves, one set working at the back of the other, as in Fig. 5, which shows a form known as the 'Meyer variable expansion gear.' The steam admission, release, and compression are determined by a main valve *MV*, and the cut-off is effected by the two valves or blocks *VV*, which slide across the back of the main valve and are operated by a separate eccentric. The cut-off valve spindle *s* is usually provided with a right and left hand screw working in suitable nuts within each valve, and by rotating this spindle the valves *VV* may be made to separate, or to come

closer together, thus varying the point of cut-off to any desired degree. The slide valve is sometimes made in the form of a piston; an example of a piston valve is shown in Fig. 6. The action is identical with that of a simple slide valve. The total pressures on the opposite ends of a piston valve are practically equal; consequently very little force is required to operate it. Piston rings are fitted to the valve to make it steam-tight. In large engines, especially of the marine type, double-ported valves have been adopted. (See Fig. 7.) With this form of valve there are two openings to each steam port instead of one, and the inner openings get their steam from two passages *AA* cast in the body of the valve. It is therefore evident that, with a given movement of the valve, the area of port opening will be twice that obtained with an ordinary slide valve; consequently the travel of the valve can be considerably reduced. The eccentric which gives the reciprocating motion to the slide valve, is set with its radius *OE* (Fig. 8) in a definite position with respect to the crank *CO*: thus the angle θ is termed the 'angular advance of the eccentric,' and the eccentric radius is $90 + \theta$ degrees in advance of the crank. *EF* is perpendicular to *CE*, and *OF* is equal to lap plus lead. The travel of the valve is equal to twice the throw or radius of the eccentric, also the eccentric radius is equal to the lap of the valve plus the maximum opening of the port to steam.

Corliss Valve Gear.—In steam-engines fitted with a slide valve the two ports serve a double purpose: they conduct the exhaust steam out of the cylinder as well as admit the fresh boiler steam. This produces an alternate cooling and heating of the ports, and causes a loss of steam due to condensation; the ports are also somewhat long, and contain a quantity of steam which is to a large extent non-effective. To remedy these defects, and to give a better steam distribution, the Corliss valve gear has been introduced, and is much used for engines of moderate speed. In this system each end of the cylinder is provided with two separate valves and ports for the admission and discharge of the steam. The valves are placed as close as possible to the working barrel of the cylinder; consequently the ports are very short. A transverse section through part of the end of a cylinder fitted with Corliss valve gear is shown in Fig. 9. The valve *A* is a portion of a cylinder, and is made to oscillate through a small angle, about *C*

as centre, on a cylindrical face in which there is a steam-port *s*. The dotted lines show the valve full open. In the Corliss gear the steam-valves open to the full extent, and with equal rapidity, whether the cut-off is to be early or late; they remain open as long as required for the admission of steam, and then close almost instantaneously. A general view of the Corliss gear on a large pumping-engine is illustrated in Fig. 10. The steam-valves *ss* are opened by links connected with a wrist plate *WP*, which is operated from an eccentric on the crank shaft. The sudden closing of the steam-valves is effected through a 'trip' or trigger mechanism connected with the governor, which causes a catch to be released when the moment for cutting off the supply of steam to the cylinder has arrived, and the valve instantly flies back to its normal position covering the steam-port. The exhaust valves *EE* are opened and closed through links connected to a wrist plate *WP*, which is worked from a second eccentric. The steam-valves are connected by suitable linkwork to dash-pots *DP*, whose function is to return the valves quickly and noiselessly when the governor releases the trip-catch. Each dash-pot is fitted with a piston, which is moved outwards by the valve gear during the steam admission; a vacuum is formed behind the piston, which is forced back by atmospheric pressure. Sometimes the piston is moved outwards against the pressure of a spring in preference to depending upon a vacuum. Another form of 'trip-gear' largely used for horizontal engines is illustrated in Fig. 11, which shows vertical transverse and longitudinal sections through one end of a cylinder fitted with Marshall's patent trip-gear. There are two admission and two exhaust valves. Each admission valve *A* is of the double-beat drop or equilibrium type, operated by a detachable trigger piece *C*, which engages with the outer end of the valve-lifting lever *B*. The motion necessary to lift the valve is obtained from an eccentric *H* keyed to a side shaft *M* driven by gearing from the crank shaft. The point at which the trigger piece *C* releases the valve-lifting lever is determined by the governor. The valve is lifted against the action of a spring contained in a cylinder *L*; this spring assists in bringing about a quick closing of the valve. Each exhaust valve *E* is also of the double-beat type, and is operated through a cam *N* on the side shaft. A cross compound engine fitted with this gear is shown in Fig. 12.

Fly-wheel.—With a single-cyl-

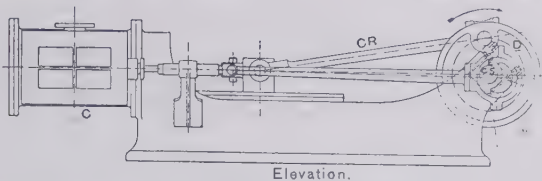
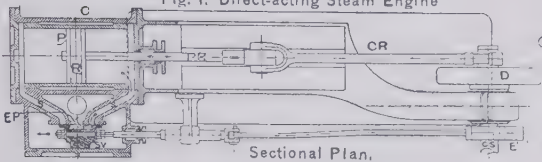


Fig. 1. Direct-acting Steam Engine



Sectional Plan.

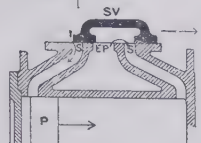


Fig. 3.

Commencement of Piston Stroke.

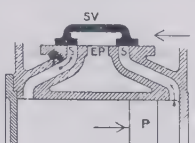


Fig. 3.

Release.

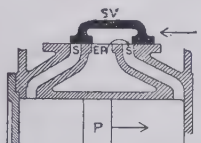


Fig. 3.

Cut-off.

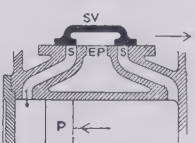


Fig. 3.

Compression.

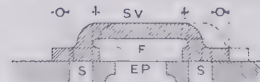
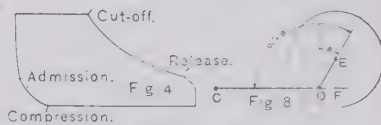


Fig. 2.

Slide Valve in mid-position.



Admission.

Release.

Fig 4

Fig 8

Fig 8

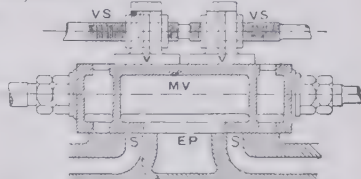


Fig. 5. Meyer Variable Expansion Gear.

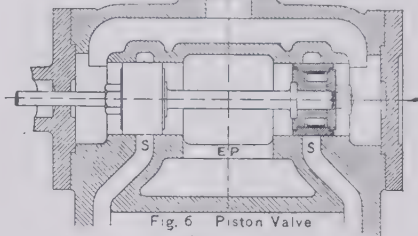


Fig. 6. Piston Valve

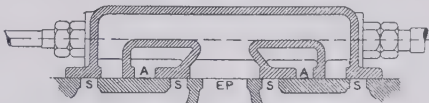


Fig. 7.

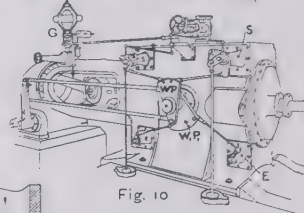


Fig. 10.

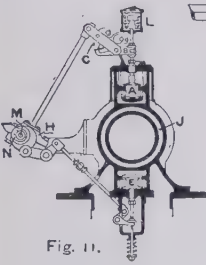


Fig. 11.

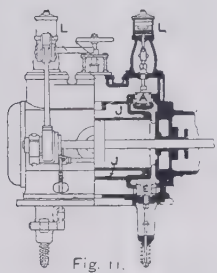


Fig. 11.

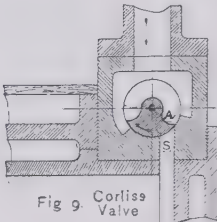


Fig. 9. Corliss Valve

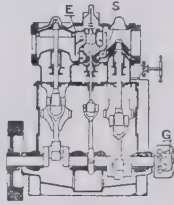


Fig. 13.

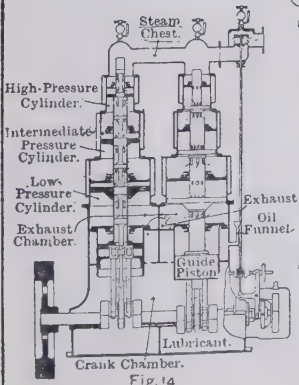


Fig. 14.

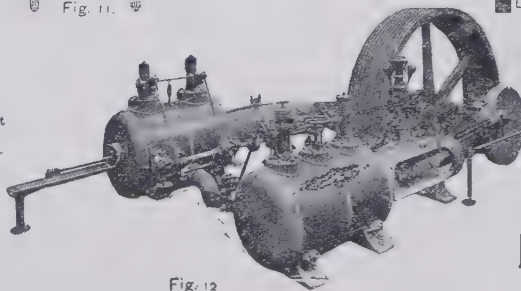


Fig. 12.

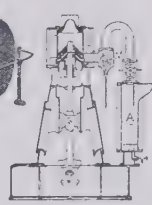


Fig. 13.

Steam-engine.—I.
(For explanation, see text.)

in a single-cylinder engine there cannot be any turning effort on the crank shaft when the piston is at either extreme end of its stroke (the crank then being on a dead centre), and in that position the engine cannot be started. A fly-wheel is always keyed to the crank shaft: when the engine is in motion the momentum of the fly-wheel helps the crank over the dead centres, and assists in making the motion of the engine more uniform. With two cylinder engines—cranks at right angles—the necessity for a fly-wheel is not so great; but one must be used, though it does not need to be quite so heavy as for a single-cylinder engine.

Governor.—Engines that are required to run at a steady speed must be provided with a governor, whose function is to bring the work done by the steam in the engine cylinder into correspondence with the actual work being done by the engine itself in driving machinery. See GOVERNOR.

Condensers.—The effective driving pressure on the piston of an engine at any instant is equal to the difference between the forward and the back pressure acting on the opposite faces of the piston. In a non-condensing engine the exhaust steam is discharged against the pressure of the atmosphere and other resistances due to the friction and wire-drawing of the steam in the ports, passages, etc.; consequently the back pressure is usually from 15 to 18 lbs. per sq. in. (absolute). By condensing the exhaust steam in a suitable condenser fitted with an air-pump or its equivalent a vacuum is formed, and the back pressure reduced to 3 or 4 lbs. per sq. in. (absolute), thus very materially increasing the effective pressure on the piston. A considerable economy is thereby effected in the working of a steam-engine by using a condenser. See CONDENSER.

Compound Engines.—Steam contains a large amount of internal or intrinsic energy, obtained during its formation in the boiler from the heat developed by the combustion of the fuel in the boiler furnace. A considerable proportion of this internal energy may be converted into mechanical work by allowing the steam to expand in the engine cylinder. The economical working of an engine is greatly augmented by using steam at a high initial pressure and expanding it to the lowest possible practicable terminal pressure; in a condensing engine the terminal pressure is usually about 10 lbs. per sq. in. (absolute), and 25 lbs. per sq. in. in a non-condensing engine. Unfortunately, if the full expansion of the steam is carried out in

one cylinder, the interior of the latter is subjected to a considerable variation in temperature, and in consequence a large proportion of the incoming steam is condensed during the admission part of the stroke without doing any work. The compound engine is designed to reduce the waste of steam due to cylinder condensation by dividing the total expansion into two or more stages, carried out in two or more cylinders, the volume of the last cylinder being several times the volume of the first. The variation in temperature in any one cylinder is thus brought within limits which are not excessive. The number of cylinders and their relative volume proportions depend upon the initial pressure of the steam and the total range of expansion. For an engine to be economical as regards steam and fuel consumption, it is now fully recognized that the compound system must be adopted, and practically all modern engines are designed according to that principle.

In a compound engine it is usually understood that the total expansion of the steam is carried out in two stages; there will be one 'high-pressure' cylinder, into which the steam is first admitted, and one or two 'low-pressure' cylinders. The second or last stage in the expansion may be divided equally between two low-pressure cylinders, when one cylinder would be inconveniently large. In triple-expansion engines there are three stages of expansion, and the cylinders are termed 'high pressure,' 'intermediate,' and 'low pressure' respectively. Occasionally engines are built with four-stage or quadruple expansion. Marine engines are usually of the triple-expansion type, with three cylinders and three cranks; latterly with large engines it has been the practice to have two low-pressure cylinders, and the power distributed between four cranks. The compound system, on account of two or more cranks being used, conduces to smoothness of running.

Stationary engines are used mainly for driving the machinery in mills, workshops, electric-light and power stations, etc. The original form of the stationary engine—the beam engine—has now been almost entirely superseded by the direct-acting type. Stationary engines may be simple, compound, or triple expansion. They may also be divided into slow-speed engines and high-speed or quick-revolution engines: the latter are mainly used for the direct driving of dynamos. An example of a high-class modern stationary engine is illus-

trated in Fig. 12. It is a coupled compound engine, cranks at right angles, and fitted with the trip-gear as shown in Fig. 11. The fly-wheel is grooved for rope-driving, and the governor is of the Proell type. If this engine is provided with a condenser, it may be fixed below the engine-house floor, or placed at the tail end of the low-pressure cylinder, the air-pump in either case being worked off an extension of the piston rod. By referring to Fig. 11, it will be seen that there is an annular space *J* between the working barrel or liner and the outer cylinder casting; this space can be filled with steam at a pressure above the mean pressure of the working steam inside the cylinder. Cylinders built on this principle are said to be steam-jacketed, the object being to keep the cylinder as hot as possible, and thus reduce cylinder condensation. The liner is usually made of a much harder iron than the main body of the cylinder. The engine bed is of the 'girder' pattern, and at one end forms the front cylinder cover. The stop valve is shown on the top of the high-pressure cylinder. For electric-light and power stations the engines are usually of the vertical type, having a high speed of revolution, and coupled direct to the dynamo. A type of this form of engine is shown in Fig. 13, in two vertical sections through the cylinders, etc. This Belliss engine is double-acting, and one piston valve of a special design distributes the steam to both cylinders; the arrows show clearly the path of the steam as it passes from the high to the low pressure cylinder. The fresh boiler steam enters the valve chamber through the opening *S*, and *E* is the exhaust port of the low-pressure cylinder. A separator *A* is shown in the view to the right; its object is to strain off any water that may come over with the steam. The engine is fitted with a centrifugal governor *G*, carried on the end of the crank shaft, and connected to an equilibrium throttle valve *V*. A most important feature of the Belliss engine is the system of forced lubrication adopted. Oil is pumped to all the bearings by means of a very simple pump worked from the eccentric. The oil is delivered at a pressure of from 10 to 20 lbs. per sq. in. through a specially-arranged system of oil channels, and the oil escaping from the bearings drains into the crank chamber, to be used over again. In the Belliss triple-expansion engine, as designed for large powers, there is a piston valve of the ordinary type provided for each cylinder.

18



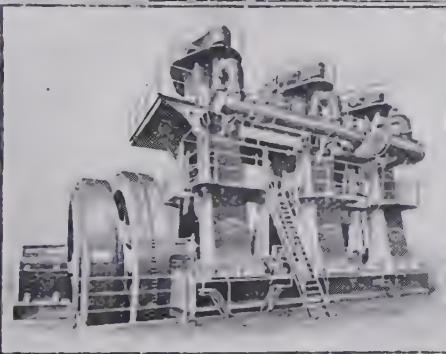
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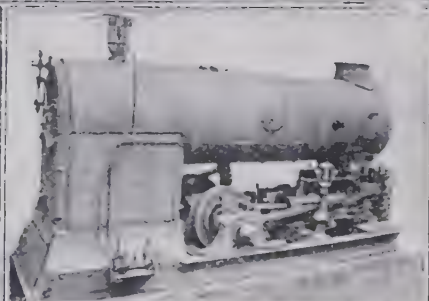
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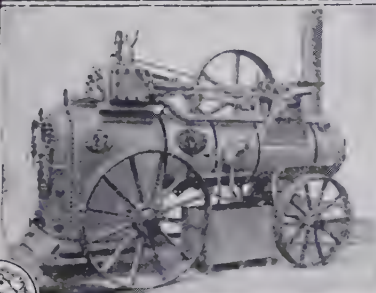
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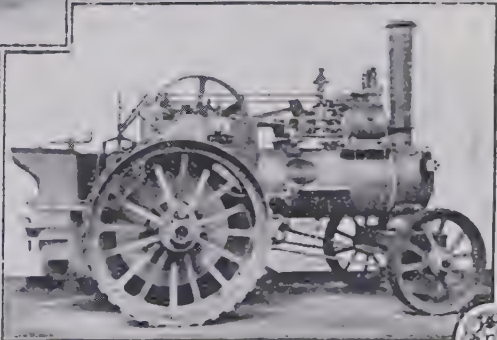
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22



24



Steam-engine. — II.
(For explanation, see text.)

Fig. 14 represents a vertical section of a Willans 'central valve' triple-expansion engine, with two sets of cylinders. The three cylinders are placed tandem fashion, and the steam is distributed throughout by a hollow piston rod or trunk, in which works a line of piston valves, driven by an eccentric mounted on the crank pin. The Willans engine is single-acting—i.e. the driving pressure of the steam acts on one side only (the upper side) of the piston. The down stroke is therefore the working or effective stroke; consequently the connecting rods, of which there are two to each line of pistons (one on each side of the eccentric), are always in compression, never in tension. It will be noticed that the trunk is provided with rings of holes or ports at intervals throughout its entire length; these rings of ports are for the purpose of admitting and discharging the steam to and from each cylinder as determined by the piston valves. Each piston valve gives just the same steam distribution as an ordinary slide valve, except that the actual cut-off is effected by the upper ports in the trunk, which at a prearranged point pass down through a gland into the cylinder, and so leave the steam-chest, thus preventing the further supply of steam for that revolution. When the steam has completed its work in any one cylinder, the corresponding piston valve is then in a position to allow the steam to pass (during the up stroke) from above the piston to the space below it, which acts as a receiver, but is really a steam-chest for the next cylinder. It is therefore evident that this particular engine must make three revolutions before the steam originally admitted to the high-pressure cylinder is finally discharged from the low-pressure cylinder into the atmosphere or into a condenser. Immediately below the low-pressure cylinder there is a guide cylinder, the top of which is closed, and on the up stroke the air in it is compressed to the extent necessary to cushion the piston and other parts. The reciprocating parts are thus 'held down' at all times, and do not depend for cushioning upon the compression of steam in the cylinders, as is the case in engines of the ordinary type. The work stored up in the air during compression is given out again on the succeeding down stroke without sensible loss. There are three types of the Willans engine—simple, compound, and triple-expansion, with one, two, or three sets of cylinders and cranks.

Fig. 15 is an illustration of one of two engines made for the Glasgow tramway power station.

These engines are of the vertical three-cylinder, three-crank compound type, with the fly-wheel and generator arranged on the end of the crank shaft. The high-pressure cylinder is 42 in. in diameter, and there are two low-pressure cylinders each 62 in. in diameter, with a stroke of 5 ft. All the cylinders are fitted with Corliss valves. Each engine is designed to develop normally 4,000 I.H.P., and a maximum power of 5,000 I.H.P. when running at 75 revolutions per minute, with a steam pressure of 150 lbs. per sq. in. The fly-wheel is 24 ft. in diameter, and weighs about 120 tons. The approximate total weight of each engine is about 700 tons. Each engine is directly connected to a three-phase generator, designed for an output of 2,500 kilowatts at a pressure of 6,500 volts.

Marine Engines.—The steam-engine as a motor for vessels was first applied in a practical form to a tug named the *Charlotte Dundas*, built by William Symington in 1802. It was a Watt double-acting condensing engine, placed horizontally, and acting directly, by means of a connecting rod, on the crank of a shaft, carrying a single paddle-wheel at the stern. In 1807 Robert Fulton made steam navigation a success by fitting a vessel with engines designed by Boulton and Watt, and in 1812 the side paddle-wheel steamer *Comet* was built by Henry Bell to run on the Clyde. This was driven by a species of inverted beam engine, and another form of inverted beam engine, known as the side-lever engine, was used in most of the other early steamboats. In the latter engine the cylinder was vertical, and the piston rod projected through the top, and from a cross-head on the rod a pair of links, one on each side of the cylinder, led down below to a pair of horizontal beams or levers, which oscillated about a fixed gudgeon near the centre of their length. Large beam engines, with beams visible far above the upper decks, are still common in American river steamers and ferry boats. The first engines to be used in the British navy (1821) were of this type. In another early type the cylinder was set vertically below the crank, two piston-rods projecting through the top of the cylinder, one on each side of the shaft and of the crank. In 1843, however, the Admiralty paddle-yacht *Black Eagle* was ordered to be fitted with oscillating cylinder engines. This new type did away with the beam, connecting rod, and levers, and at the same time enabled the cylinders to be placed directly under the crank shaft. To en-

able the piston rod to adapt itself to the movements of the crank, the cylinder was mounted so as to swing or oscillate, and two short arms or trunnions, projecting on opposite sides near the middle of the cylinder, were provided as supports. These were made hollow, with shut-off valves, one trunnion being for steam to enter the cylinder, the other for exhaust steam to pass to the condenser. This oscillating engine was patented by Joseph Maudslay in 1827, and first used for marine purposes in 1828. The adaptation of the screw propeller in 1841 to the *Rattler* was a revelation to the adherents of paddle-wheels. This vessel was at first fitted with a 'geared engine'—i.e. an engine of the oscillating kind, working with a triple spur wheel geared into a cogged pinion on the screw shaft. Ere long the engines came to be coupled directly to the main shaft without the intervention of cogs. Penn's trunk engine was one of the best of the fresh developments.

In 1853 high-pressure steam was introduced into the navy; but it was not till 1860 that the *Victoria* was fitted with engines working with steam pressure of 22 lbs. With the object of reducing the consumption of coal, the *Constance*, steam-frigate, was in 1862 provided with six cylinders, being thus the earliest example of a warship with a compound engine. The arrangement, however, was not very successful, and no marked improvement was effected until 1865, when the *Pallas* was launched, with two cylinders instead of six, one being four times larger than the other. The steam entered the smaller one at high pressure, in this case 60 lbs., and thence passed into the larger one, which it filled by expansion. She had surface condensers, and was, on the whole, economical in fuel. The success of this ship caused the general adoption of compound engines throughout the fleet. The return connecting-rod engine, a form of steeple engine placed horizontally, with two and sometimes four piston rods in each cylinder, was an invention of the same period. Between 1875 and 1880 two improvements were brought about in engine-making—viz. hollow compressed steel shafting, which greatly increased durability, and at the same time reduced weight; and tandem engines—i.e. the placing of the two cylinders in line instead of side by side, thus effecting a great gain in space. The inverted cylinder or 'steam-hammer' engine, so called from the manner in which the cylinders are placed above the crank, was the next improvement in naval

engines. In 1878 the introduction of the triple-expansion system resulted in an increase of steam pressure from 90 lbs., the limit of the compound type, to at least 150 lbs., with at the same time an economy of fuel. The *Rattlesnake*, torpedo-boatcatcher, of 1886 (550 tons) was the first ship to be fitted with engines of the triple-expansion vertical type. A further development was achieved in the cruisers *Blake* and *Blenheim* (9,000 tons) of 1890-1. In these ships there are four sets of vertical triple-expansion engines, working in pairs. Some modification of this inverted vertical direct-acting engine had much earlier become general in the mercantile marine, and two, three, and four cylinders have long been common.

Engines for ship propulsion are now practically all of the vertical three or four cylinder triple-expansion type, with three or four cranks. The high-pressure, and sometimes the intermediate, cylinder is fitted with a piston valve, while the low-pressure cylinder is usually provided with a double-ported slide valve. The direction of motion of a marine engine must be capable of being reversed, and for this purpose each cylinder is fitted with some form of reversing gear. In the Stephenson gear or link motion (shown diagrammatically in Fig. 16), the type usually adopted, there are two eccentrics, E and E_1 , symmetrically placed relatively to the crank C , and keyed to the shaft. Each eccentric is connected by a rod R to the opposite ends of a curved slotted bar or link L , which can be moved transversely with respect to a block B fitted in the slot or on the bar. The end of the slide valve rod S is attached to the above block, and by moving the link the slide valve may be brought under the influence of either eccentric. The movement of the link is effected through suitable levers by a handle H or (in large engines) by an auxiliary steam-engine. In the upper figure the block is in the middle of the link (mid-gear), and the valve is equally acted upon by both eccentrics; in this position the engine will not run in either direction. In the lower figure the valve is under the direct influence of the eccentric E , and is in the full-gear position. With this gear it is also possible to vary the point at which the steam is cut off. By placing the link in any position between mid-gear and full back or forward gear, the travel of the valve is reduced, and the steam cut off at an earlier point of the stroke. All marine engines are provided with surface condensers.

In many of the best designed marine engines vibration is greatly reduced by having four cranks arranged at certain definite angles with respect to one another according to the Yarrow-Schlick-Tweedie system. In twin-screw steamers there is an engine for driving each propeller shaft.

An illustration is given in Fig. 17 of one of two sets of four-cylinder triple-expansion engines for H.M. first-class cruiser *Leviathan*. The engines are together capable of developing 30,000 I.H.P. when running at 120 revolutions per

pressure cylinders are fitted with double-ported slide valves. There are four main surface condensers, having a collective cooling surface of 32,000 sq. ft. Four 24-inch centrifugal circulating pumps, each driven by independent engines, are provided for the main condensers. Two air-pumps are provided for each set of engines, worked by levers from the main engines in the usual manner. The shafting is of forged steel, and is hollow, the crank and thrust shafts having an external diameter of 21 in., and the tunnel shafts 19 in. in

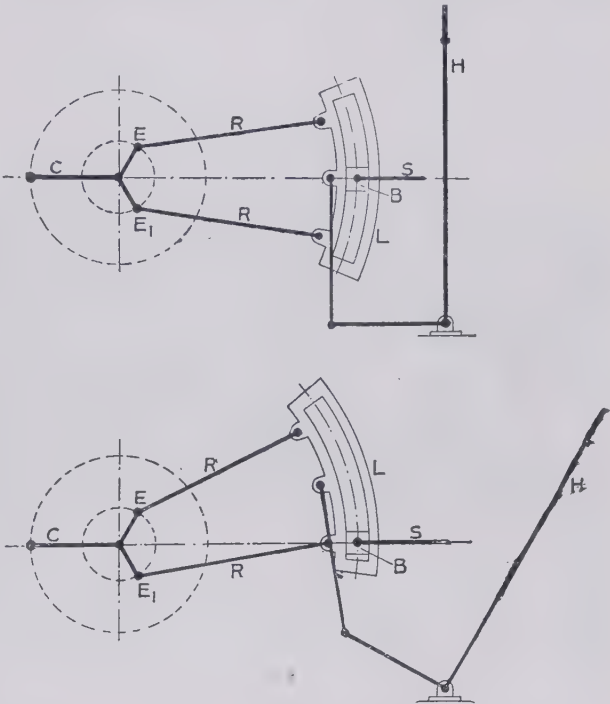


FIG. 16.—Stephenson's Link Motion.
(For explanation, see text.)

minute, steam being supplied by forty-three water-tube boilers of the Belleville type, working at a pressure of 300 lbs. per sq. in. The dimensions of the cylinders on each engine are as under:—

	Diameter.
High-pressure cylinder	43½ in.
Intermediate cylinder	71 in.
Low-pressure (two) cylinder	81½ in.
Stroke	43 in.

All the cylinders are fitted with separate liners, and are steam-jacketed. The high-pressure cylinder is fitted with one piston valve, the intermediate cylinder with two piston valves, and the low-

diameter, each with an 11-inch hole. The propeller shafts are 21 in. in diameter, with a 12-inch hole, and are fitted with brass liners where they pass through the stern tube, the latter being lined with strips of lignum vitae. The propellers are three-bladed, and about 19 ft. in diameter, the bosses being of gunmetal and the blades of manganese bronze; a conical cap is fitted over each propeller nut. The boilers are made up as follows:—Five boilers having ten elements, with eight element economizers; twenty-eight boilers having nine elements, with seven element econo-

mizers; and ten boilers having eight elements, with six element economizers. The total heating surface is 71,970 sq. ft., and the total grate area is 2,310 sq. ft. The boilers are arranged in four groups, each group being in a separate compartment. The uptakes of each group of boilers lead into a separate funnel, making in all four funnels. Each compartment is subdivided, making in all eight stokeholds. There are sixteen stokehold fans driven by independent engines. Four main and four auxiliary feed pumps are fitted in the boiler rooms for feeding the boilers.

On a thirty-hours' coal-con-

George Stephenson's 'Rocket' won the prize of £500 for the best locomotive engine suitable for passenger traffic. It weighed, with its supply of water, about 4½ tons, and its greatest speed with a small load on a level track was about 30 m. an hour. Express engines of the present day frequently weigh over 70 tons in full working order, and with tender over 110 tons; while the ordinary average speed often exceeds 50 m. an hour over a considerable journey on a road in which there may be many stiff hills to climb, and the load drawn more than 300 tons. During the so-called 'race to Aberdeen' in 1895, a train was

crank shaft. The application of the tractive force of the locomotive depends upon the turning of the driving wheels by the engines acting on their cranks. It is therefore necessary that between the rails and the tread of the driving wheels there should be sufficient frictional adhesion to prevent slipping when the force is applied. The friction may be temporarily increased so as to give the wheels a better hold of the rails by projecting a jet of sand directly under the tread of the driving wheels. Most of the recently-constructed locomotives have a second pair of wheels equal in diameter to the pair on

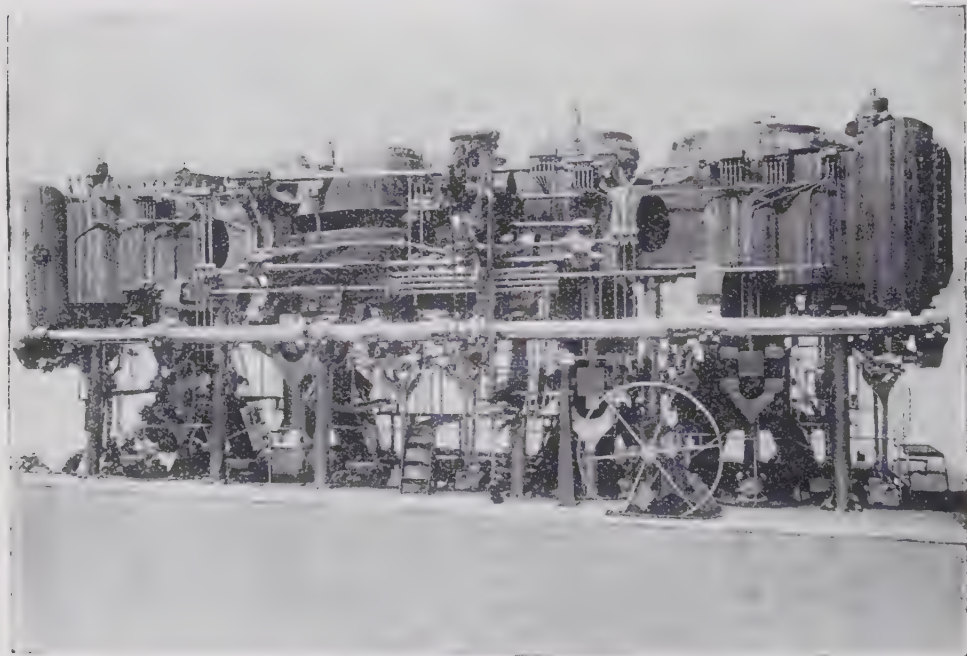


FIG. 17.—Four-cylinder triple-expansion Engines of H.M.S. 'Leviathan.'

sumption trial at three-quarter full power, these engines developed 22,882 I.H.P., with a coal consumption of 1.75 lbs. per I.H.P. per hour, the mean speed of the vessel being 21.96 knots per hour. See Beesley's *The Marine Steam-engine* (1892), *Proceedings of International Engineering Congress at Chicago* (1893), Thurston's *A Manual of the Steam-engine* (1892), Seaton's *A Manual of Marine Engineering* (15th ed. 1903), Reynolds's *Triple-expansion Engines and Engine Trials* (1890), Clark's *The Steam-engine* (1891), and Leask's *Triple and Quadruple Expansion Engines* (4th ed. 1902).

Locomotive Engines.—In 1829

run from London to Aberdeen by the London and North-Western and Caledonian Rys., a distance of 540 m., in 8 hrs. 32 min., or at an average inclusive rate of 63.3 m. an hour; the greatest speed during the run was 85 m. an hour.

The ordinary locomotive consists of a pair of direct-acting engines fixed to a rigid frame, on the top of which is the boiler. The cylinders of the engines are placed either inside or outside the frame, and are connected in the usual way to two cranks forming part of a single crank shaft, on which they are at right angles to one another. The driving wheels of the engine are attached to the

the crank shaft, and connected to the latter by side or coupling rods. Many modern engines for hauling heavy loads have as many as three pairs of wheels coupled; a few have four and five pairs coupled. Locomotives are fitted with some form of reversing gear. Each cylinder is provided either with a single slide valve or a piston valve, which is worked by a separate link motion. The link motion connects the slide valve with a rotating crank shaft in such a way as to admit steam to the cylinder and allow it to escape at the times required for the efficient working of the engine. Both link motions are connected by links and levers to

the same shaft, which is operated by a reversing motion handle or lever in the engine cab. In Great Britain the Stephenson link motion is usually adopted. On the Continent and in the United States Walschaert's radial gear is extensively used. The principle of the compound engine, with two high-pressure and one or two low-pressure cylinders, is also applied to the locomotive with satisfactory results. As a locomotive is required to exert the greatest tractive force in starting the train from rest, a small supply of boiler steam can be admitted direct into the low-pressure cylinder. The leading end of the engine is carried on a four-wheeled bogie swivelling

paratively free from 'priming' water. The steam pressure in most modern express locomotives varies from 160 to 220 lbs. per sq. in. The water tank in the tender of a locomotive usually holds from 2,000 to 5,000 gallons. Where long journeys have to be covered without a stop, the tenders are sometimes fitted with the Ramsbottom scoop for picking up water while the engine is running at full speed. The scoop can be lowered by the driver into a trough of water laid longitudinally between the rails on a level length, and the water is forced up the scoop into the tank.

A very fine example of a six-wheeled coupled bogie express

through a small die block to an intermediate valve rod, connected to a Stephenson's link motion in the usual manner. The reversing of these engines is effected in a very ingenious way by an arrangement of steam and water catract cylinders, which renders manual labour almost unnecessary, the whole operation being under control by the movement of one small lever. It will be seen that the engines are connected directly to the middle pair of wheels, which are in turn coupled to the leading and trailing wheels. The boiler is of steel, and has a fire-box shell known as the Belpaire type. There are 209 brass boiler tubes (not shown in the drawing), each two inches

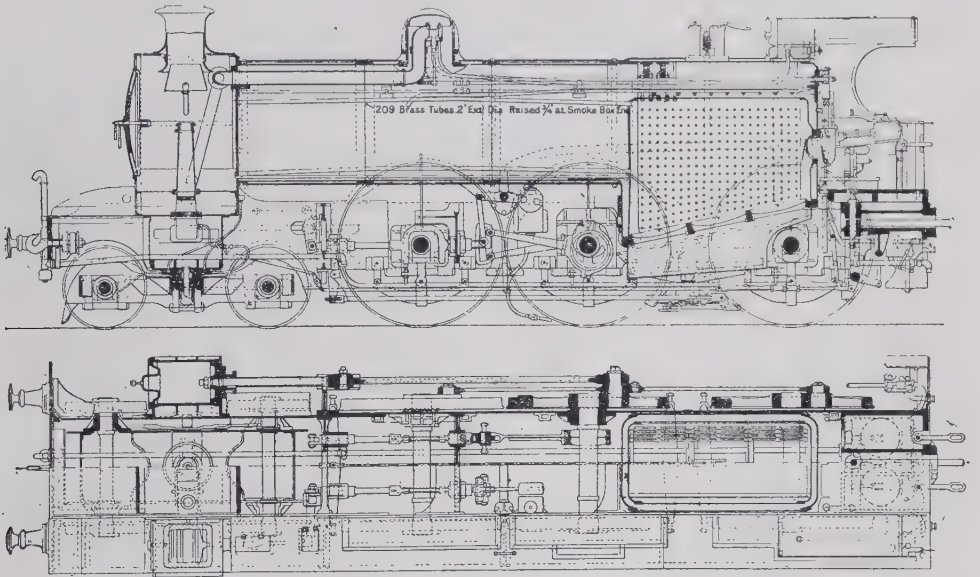


FIG. 19.—Six-wheeled coupled bogie Express Locomotive (N.B.R.)—
sectional elevation and plan.

on a central pivot so as to adapt itself to the curves of the road. The exhaust steam is delivered through a blast-pipe—placed in the smoke-box and immediately under the funnel—and serves to produce a draught of air through the furnace; the same is effected when the engine is standing by blowing steam through a perforated pipe fitted near to and encircling the top of the blast-pipe. Most locomotives are provided with a dome placed on the top of the boiler; the dome contains the regulator valve which acts as a stop valve and controls the admission of the steam to the pipe leading to the engine cylinders. The steam, being thus taken off so high above the level of the water in the boiler, is com-

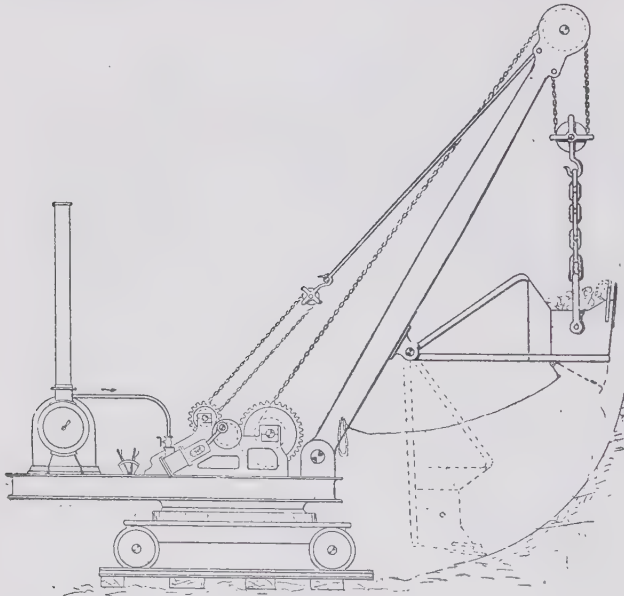
locomotive is shown in Fig. 18; also in sectional elevation and plan in Fig. 19. (Published with the permission of the *Engineer*.) This engine is one of ten constructed by the North British Locomotive Company for the Glasgow and South-Western Railway Company, to the design of Mr. James Manson, the locomotive superintendent of the latter company. They are intended to cope with the heavy and fast service between Glasgow and Carlisle, a distance of 115½ m., and some of the express trains do this at a net average speed of 51 m. an hour. The cylinders are placed outside the frames, with the slide valves on top. The slide valves are operated from a rocking shaft, the lower arm of which is coupled

external diameter; the inner fire-box is of copper. Working pressure per sq. in., 180 lbs. Total weight of engine and tender in working order, 117 tons 8 cwt.

In the United States the locomotives, as a rule, are much larger and heavier than in Britain. The locomotive illustrated in Fig. 20 was made at the Baldwin Locomotive Works, Philadelphia, for the New York, New Haven, and Hartford Ry. It has compound engines of the Vaucain balanced type, the object being to reduce to a large extent the vertical shocks which otherwise would be set up by the imperfect balancing of the reciprocating parts of the engine. There are two high-pressure cylinders inside the frames driving the

front axle, which is cranked. In the engine shown the outside low-pressure cylinders drive the same axle, but in the case of the balanced compound Atlantic type the low-pressure cylinders drive the rear axle. The inside cranks are set at 90° with each other, and at 180° with the corresponding crank pins in the wheels. The pistons therefore travel in the opposite direction, and the reciprocating parts act against and balance each other to the extent of their corresponding weight. With a self-balanced arrangement of reciprocating parts, it is considered that the weight on the driving wheels may be increased without damaging the track, and higher speeds attained without

which is of locomotive type, the whole being mounted on travelling wheels, so that it can be readily transported from place to place as required. Semi-portable engines are similar to the above, except that they are without the travelling wheels. Fig. 23 illustrates a compound underneath type stationary engine and boiler combined. It is fitted with a Proell governor and two-valve releasing gear to the high-pressure cylinder, and Meyer's variable expansion gear to the low-pressure cylinder. A Worthington feed pump is shown attached to the main frame. A compound traction engine is shown in Fig. 24. This type is used for driving machinery and for



Steam-navvy, or Mechanical Excavator.

undue strain upon the working parts of the locomotive. The Baldwin Company has also built a number of very heavy locomotives for the freight service of the Atchison, Topeka, and Santa Fé Ry., on which there are many steep mountain gradients. One of these engines is illustrated in Fig. 21. It is a ten-wheel coupled compound engine with four cylinders; each high-pressure cylinder is placed in front of the corresponding low-pressure. Piston valves of a special design are used, and it will be seen that the valve chest is immediately above the cylinders.

Various Steam-engines.—In the portable compound engine (Fig. 22) the engine mechanism is carried on the top of the boiler,

haulage on roads. It is fitted with link-motion reversing gear and a quick-speed throttling governor. The driving wheels are connected by gearing to the engine crank shaft, and two speeds are provided. Steam road rollers are similar in general design to traction engines, except that the front part is extended somewhat, and a heavy roller substituted for the two front wheels. The boiler for motor buses and cars is usually in the form of a tube made into a coil and heated with a paraffin burner of special construction. The feed water is forced through the coil, and is practically converted into steam instantaneously. The exhaust steam is condensed in a suitable condenser. See *The Steam-en-*

gine and other Heat Engines, by J. A. Ewing; *Steam-engines*, by J. Perry; *Steam-engine—Theory and Practice*, by W. Ripper; *Valves and Valve Gearing*, by C. Hurst; *A Manual of Locomotive Engineering*, by W. F. Pettigrew; *Modern Locomotive Practice*, by C. E. Wolff; *Steam and Steam-engines*, by A. Jamieson; and Lake's *The World's Locomotives* (1905).

Steam-gauge. See PRESSURE GAUGE.

Steaming. See COOKERY.

Steam-navvy, or STEAM-SHOVEL, a machine for excavating earthwork. Its essential parts are (1) a bucket; (2) means for actuating and controlling the bucket. The bucket is made of plate iron or steel, and has pointed teeth where it enters the ground. Its capacity is usually from three-quarters of a cubic yard to one and a half cubic yards. The bottom of the bucket is hinged, and is normally kept shut by a catch, which may be liberated by a string when the bucket is to be emptied. The means for actuating the bucket is generally a self-propelling steam-crane. The bucket is held up to the face of the work by compensating gear, controlled by a steam-cylinder or worked by hand. Rails are laid, over which the steam-navvy can travel up to the face of the cutting. The wheels on which the apparatus travels are then fixed by scotches or billets, or the whole carriage may be lifted up by screw jacks, and so take the weight off the wheels. The mechanism is then set in motion, and the bucket enters the earth, and pares a slice of from four to six inches right up the face. The apparatus is then swung round and the bucket emptied, usually into a wagon. The weight of a steam-navvy being considerable, its use is precluded in swampy or soft ground. The illustration shows a mechanical excavator. The power of these varies from five to twelve horse-power, and the largest size will take the place of eighty men. This machine is useful owing to the ease with which the excavating gear may be removed and the machine used as an ordinary travelling crane.

Steam-plough. See IMPLEMENTS AND MACHINERY.

Steam Turbine. See TURBINE.

Stearic Acid, $C_{17}H_{35}COOH$, an acid of the fatty or acetic acid series that occurs largely in the solid fats as a glycerol ester. It is prepared by saponifying tallow with caustic potash solution, setting free the impure stearic acid from the resulting soap by the action of a dilute acid, and purifying the product

by recrystallization from alcohol and fractional precipitation by magnesium acetate. On the commercial scale the fats are saponified either with a small quantity of lime under pressure, or by the action of superheated steam alone; the product, which is mixed with palmitic acid, is purified by pressure. Stearic acid when pure forms pearly crystals, which melt at 69°C , and are slightly soluble in cold alcohol. The commercial product, under the name of 'stearine,' is largely used for the manufacture of candles, being mixed with a little paraffin wax to destroy its crystalline structure.

Stearin, glycerol tri-stearate, $(\text{C}_{17}\text{H}_{35}\text{COO})_3\text{C}_3\text{H}_5$, is, along with glycerol tri-palmitate, the main component of the solid fats. In a pure state it forms pearly crystals, which are tasteless, and insoluble in water, but dissolve in ether and similar solvents. It is decomposed on heating under atmospheric pressure, but can be distilled in a vacuum. It must not be confused with 'stearine.' See STEARIC ACID.

Stearite. See TALC.

Steatornis. See GUACHARO.

Stecchetti, LORENZO, the pseudonym of Olindo Guerrini (1845), Italian poet and scholar, who was born at Forlì, and became librarian at Bologna. His first volume, *Postuma Canzoniere di L. Stecchetti* (1877), is full of fine poetry, but is remarkable for its unveiled sensuality. He defended his standpoint in *Polemica* (1878) and in *Nova Polemica* (1879; 9th ed. 1890). Guerrini's complete poetical works were issued as *Le Rime* (1903). He has also written treatises on various Italian authors (e.g. a *Vita di Giulio Croce*, 1879). See monographs by Vivarelli (1879), Gelmetti (1880), and Lodi (1886).

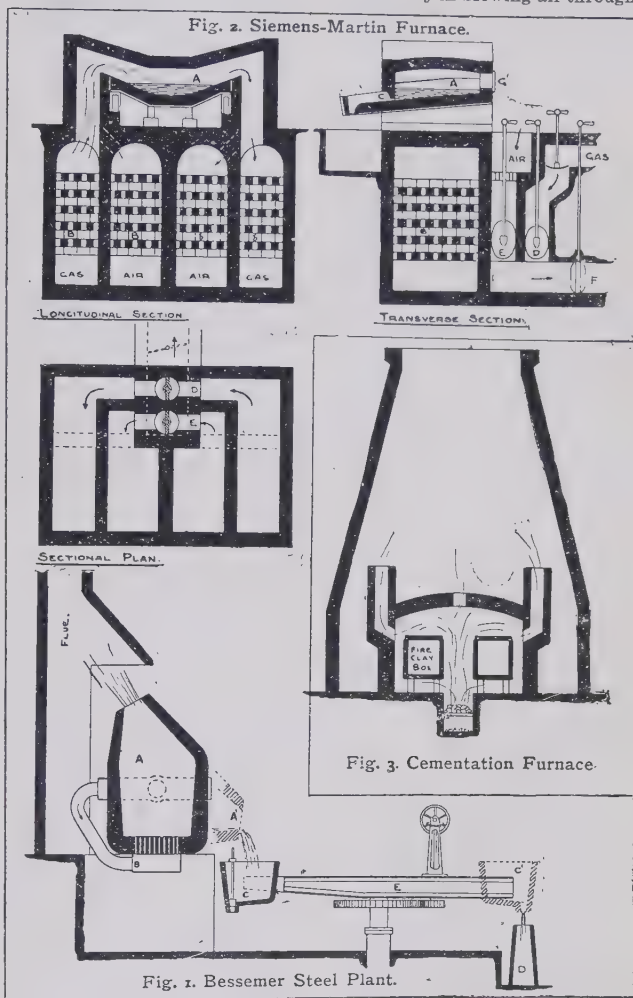
Stedman, EDMUND CLARENCE (1833), American poet, critic, and editor, born in Hartford, Connecticut; became a journalist, and was war correspondent for the *New York Times* (1861-3). From 1865 to 1900 he was on the New York stock exchange. His works include *Poems, Lyric and Idyllic* (1860); *Alice of Monmouth* (1864); *The Blameless Prince* (1869); *Poetical Works* (1873); *Hawthorne and Other Poems* (1877); *Lyrics and Idyls* (1879); *Victorian Poets* (1875); *Poets of America* (1885); and *Nature and Elements of Poetry* (1892). He has also edited *The Library of American Literature*, with Ellen M. Hutchinson (11 vols. 1888-90); *Works of Edgar Allan Poe* (10 vols. 1895), with Professor G. E. Woodbury; a *Victorian Anthology* (1895); an *American Anthology* (1900); and *Mater Coronata* (1902).

(8)

Steel, a metal chiefly composed of iron, with from '1 per cent. to 3 per cent. of carbon, and traces of other elements. Steels may roughly be divided into the mild or low-carbon steels, containing from '1 per cent. to '2 per cent. of combined carbon (rail

by the Siemens-Martin process, whilst the tool steels, though also obtainable by these methods, are usually prepared by the cementation process.

Bessemer Process.—This was patented in 1855, and consists essentially in blowing air through



Steel Manufacture: Bessemer, Siemens-Martin, and Cementation Processes.

Fig. 1. A, Converter, blowing position; A¹, converter, pouring position; B, tryster box; C, casting ladle; C¹, casting ladle in casting position; D, ingot mould; E, casting crane. Fig. 2. A, Hearth; B, regenerator; C, tapping hole; D, gas valve; E, air valve; F, chimney damper; G, charging door.

steels rise to '5 per cent.), which are not appreciably hardened by being heated red hot and quenched in water; and the high-carbon or tool steels, containing from '7 per cent. to '15 per cent. of carbon, which are much hardened by the above process. The mild steels are produced by the Bessemer or

molten pig iron, thereby effecting the combustion of the carbon, silicon, and manganese. The apparatus or converter consists of a spherical or pear-shaped shell of wrought iron, supported on standards by means of trunnions and, in the original or 'acid' variety of the process, lined with

ganister. A pinion is keyed to one of the trunnions, so that the vessel can be turned through an angle of 180°, one of the trunnions being also hollow to allow the air from a blowing engine to pass to the twyer box, fixed to the removable bottom. The bottom is perforated to receive the fireclay twyers, each of which has twelve or more holes to admit the blast to the iron in the converter. Molten pig iron, which must be low in phosphorus, is run into the vessel when in the horizontal position; the blast of air, at a pressure of 25 lbs. per square inch, is then turned on, and the vessel is rotated to the vertical position. As a result, the silicon of the pig iron is first burnt off and ejected from the converter as white-hot slag; the carbon then burns, a large flame of carbon monoxide issuing. The end of the blow is seen by the dropping of the flame, which indicates that all the carbon is removed. About 10 per cent. of spiegeleisen or its equivalent of ferro-manganese is added to produce the desired percentage of carbon, and the steel is then run into the ladle and cast into ingots. The basic Bessemer process differs from the above in that the pig iron may contain as much as 2 per cent. of phosphorus, but requires to be low in silicon. The lining is basic, being a mixture of calcined dolomite and tar, and is capable of uniting with the phosphorus on its oxidation after the carbon, forming a basic slag.

Open-Hearth or Siemens-Reverberatory Process.—The furnace is reverberatory, and is arranged so that air and gas may enter at one end and burn over the hearth, while the waste gases make their exit at the other. The waste gases pass through regenerators, making the brickwork in one pair red hot, whilst the other pair, which have been previously heated in a similar manner, are heating up the gas and air. The furnace may be worked with an acid or basic lining, the latter being, from the shape of the furnace, more easily adapted than in the Bessemer converter. In working the process a charge of pig and scrap iron are melted in the furnace and hematite added, and the amount of carbon and silicon present in the pig iron is lowered both by dilution with the pure scrap and also by the oxidation caused by the furnace gases and the oxygen of the hematite. The carbon may either be entirely removed from the metal, and the desired quantity restored after it has been run into the ladle by adding spiegel or ferro-manganese, or else the process of oxidation may be stopped at the required point.

Mild steel, as made by either of the above processes, is a grayish-white, homogeneous metal, of silky fracture and very great tenacity and toughness, provided that the sulphur and phosphorus present together do not exceed '05 per cent. The tensile strength varies from 20 tons to 40 tons per square inch, according to the carbon present, very considerable elongation taking place before fracture occurs. Mild steel is thus the most valuable constructive material, and has largely superseded wrought iron. It can also be cast, and though more difficult to manage than cast iron, it gives much stronger and lighter castings.

In preparing tool steel by the cementation process, the furnace is rectangular in plan, covered with an arch, and contains a rectangular fire-brick vessel on each side of the fireplace. Each vessel is about 12 ft. long and 4 ft. square, and is charged with Swedish bar iron and charcoal in alternate layers. The top is covered to exclude air, and the bars heated from a week to a fortnight, according to the amount of carbon it is desired to introduce into the steel. As a result, the carbon unites with the iron and converts it into a crystalline mass, termed 'blister steel,' from the blisters on the surface. In order to make the product uniform, the bars may be cut up, piled, and welded one or more times, forming 'spring' or 'shear steel,' or it may be melted in crucibles, when it forms 'cast steel.' Cementation is also used for case-hardening iron by heating it for a short period to a high temperature in contact with carbon or carbonaceous materials, such as potassium ferrocyanide, so as to produce a skin of steel. Harveyized steel plates for armour-clad vessels are cemented with carbon by heating one face in contact with charcoal, and then chilling it with jets of cold water, thus producing a plate with a very hard face, backed with soft, tough metal. Tool steel differs entirely from mild steel in being hardened by sudden cooling when red hot. The explanation of this is believed to be that iron occurs in a hard form above a certain temperature (about 650° C.), and that by chilling it when above that point it remains in this state; which, however, is destroyed and the steel softened if the latter is heated up again to a less degree. The carbon present probably also undergoes a change in its state of combination. The presence of certain elements, such as tungsten, in the steel renders it self-hardening, so that it does not lose its temper when moderately

heated. Such steels have a very important application for tools for cutting and turning metals at high speed, where the tool would otherwise get hot and lose its hardness. Special steels containing chromium, nickel, manganese, aluminium, etc., are also made, and have various valuable properties, such as great strength, hardness, non-magnetic properties, and small extensibility by heat. See Harbord and Hall's *Steel* (1904).

Tempering.—If a piece of steel, containing from 2 per cent. of carbon upwards, is heated red hot and then suddenly cooled by quenching in water or other cooling liquid, it becomes hardened to a degree depending on the carbon content up to 1 per cent., and on the suddenness of the cooling. Reheating reduces the hardness or tempers the steel; the higher the temperature to which it is reheated the softer it becomes. This temperature is usually judged from the colour of the film of oxide formed on the bright steel, and the softening is arrested by cooling in water when the desired colour is reached.

The total steel production of the world in 1903 amounted to about 35,000,000 metric tons, of which the United States may be credited with 14,000,000 tons, Germany with 8,500,000, the United Kingdom with over 5,000,000, France with over 2,000,000, and Belgium with over 1,000,000. See IRON, and bibliography there given; also Macfarlane's *Practice of Iron and Steel Manufacture* (1906).

Steel and Iron Construction. The uses of steel and iron in construction are chiefly exemplified in beams, columns, and braced structures. All longitudinals subject to a bending load may be classified as beams. Beams supported at both ends are termed girders, whether consisting of a single rolled joist, of built-up plates, or of a combination of plate flanges with an open-work web, as in lattice girders. They are employed for spanning openings over which weight has to be carried. Beams supported (and fixed) at one end only are known as cantilevers, and are used as brackets for supporting balconies, veranda roofs, and other projecting portions of a structure. The most varied application of beams is in connection with bridges. Columns are upright posts sustaining a vertical load, usually imposed upon them by the ends of beams or roof principals which they support. Braced structures include all contrivances for spanning an opening, or sustaining (while composing) an erection, which consist of a jointed framework of steel or

iron members. Steel has now practically superseded wrought iron for beams and braced structures, being slightly stronger, less susceptible to corrosion, and not more costly. The use of cast iron is restricted to columns, base-plates, and other parts where compression only has to be borne, owing to the low and uncertain resistance which this material offers to tensile stresses.

The object to be kept in view in designing structures of steel or iron is to make provision in every part for the greatest stress that can be brought upon it by any condition or combination of external forces or loads, at the same time avoiding waste of material and extravagance of proportions. For this purpose it is necessary to arrive at the magnitude and direction of the external forces, the stresses which these forces produce in the structure, and the degree in which the component parts of the structure are fitted to resist the stresses. In beams the upper member is in compression, the lower in tension, while the web or portion separating the two flanges is in shear. Columns are, as regards their main bulk, in compression alone. Braced structures of all descriptions are so designed that their component members are in either compression or tension, shearing stress being, with the exception of such parts as may be treated as beams, confined to the joints. The first step in designing any structure is to calculate the loads upon it, and the points at which these loads will act. In the case of bridges the former consist of the dead load, due to the actual weight of the girders and flooring, and the live or rolling load, due to the impact of the train. In the case of buildings, the calculations are simplified by the absence of any live load. The weight of roof, walls, and flooring is constant and easily arrived at; that of snow (on a roof) is estimated according to the severest conditions liable to occur; while the additional load liable to be imposed by the presence of persons on the upper floor of a building is taken to be that due to a crowd of people standing closely throughout. All these loads act vertically downwards. In the case of roofs and of high-braced structures generally, a horizontal pressure due to the wind has also to be taken into account. The maximum horizontal wind-pressure in Britain is usually taken as 50 lbs. per sq. ft., which in a roof of average pitch amounts to between 30 and 40 lbs. per sq. ft. of its surface. The loads and their position having been determined, the requisite strength of each member is arrived at by calculation,

aided by graphic methods, based on the actual measurement of diagrams drawn on paper.

In the case of a beam supported at both ends and loaded at one point, the moment, or leverage, of that load varies as the product of its distances from each point of support; thus it is greatest when the load acts at the centre of the beam. This may be represented graphically (as in Fig. 5) by drawing a triangle with its base corresponding to the effective span of the beam, and the vertical height at its apex equivalent in position and magnitude to the moment of the load. Then the moment of that load at any other point may be ascertained by measuring the normal from the base to the opposite side of the triangle. The moments of a series of equal loads acting at different points may thus be successively represented, until, in the case of a beam loaded uniformly throughout (Fig. 7), the diagram assumes the form of a parabola, with its axis passing through the centre of the beam. In the same way, the diagram for a number of unequal loads takes the form of a polygonal figure, having an angle in the vertical plane of each point of thrust.

Figs. 1 to 8 illustrate the diagrams of bending and shearing moments produced in cantilevers and girders by the simplest applications of external forces—*viz.* either concentrated at one point or distributed equally throughout their length. In a cantilever, or beam fixed (and supported) at one end, the moment of flexure is greatest at the point of support, while in a beam supported at both ends this moment is greatest at the centre. Shearing moment, on the other hand, is never greater than at the points of support.

In considering the stresses resulting from bending moments, a beam may be looked upon as divided longitudinally by a neutral axis running through the centre of gravity of its cross-section. Above this line the metal is in compression, below it in tension; and the stresses in each part increase in proportion to their distance from the neutral axis, where there is no direct stress. The resistance of material to stresses increases directly as the stresses themselves. Hence the metal lying at the outer edges of the beam performs the maximum amount of work, and that at the centre no work at all. The usual girder form of wide flanges and a thin web is at once suggested from this. Shearing stress, on the other hand, is greatest at the neutral axis, and decreases to nothing at the outer edges of the section, and is guarded against

by stiffening the web at intervals with vertical strips of metal. In designing columns of above a short length, it cannot be ensured that the line of pressure will always act directly along the axis of the column—*i.e.* through the centre of gravity of its section—and hence a tendency to buckle or bend is produced, which brings transverse stresses to bear on the metal of the column. It is not easy to calculate theoretically what these stresses will amount to, and in designing columns recourse is had to certain formulae derived from actual experiment. Constant multipliers are given in these for varying lengths of columns, and for the altering conditions, which depend on whether they are fixed at the ends or free to move about their points of support. The stress in individual members of a braced structure is arrived at by resolving the external forces acting upon each joint into the component forces acting in the directions of its several members. This may be calculated algebraically, or, more simply, determined by the aid of graphic statics.

The method of most general application is based upon the theorem of the parallelogram of forces, and its converse. Hence the most complicated problem in braced structures may be solved by taking each joint in succession, finding the resultant of the forces acting on it, whether external or communicated from an adjoining member, and again resolving this resultant into forces acting along the lower members which meet at that point. This method is, however, liable to errors in practice, owing to the fact that small inaccuracies in drawing the diagrams are cumulative.

A more convenient method of designing braced structures, and one which is checked in the construction of the diagram, is based on the secondary theorem, known as the polygon of forces. By this means, if the magnitude and direction of one force acting on the joint of a braced structure be known, and the direction only of the others (of any number), their magnitude also can be found by the simple expedient of drawing a polygonal figure with its sides parallel to the direction of the forces, taken in order; while the accuracy of the diagram is assured if the sides of the figure close in correctly.

Figs. 9 and 10, for example, represent respectively the frame and stress diagrams of a simple roof truss, where W_1 , W_2 , and W_3 are equal external forces (due to the weight of superstructure, snow, etc.), acting vertically downwards, and R_1 and R_2 (the reactions at

the points of support) are each equal to $\frac{W_1, W_2, W_3}{2}$, and act vertically upwards. Fig. 10 is obtained from Fig. 9 by first setting out the line ak , representing, to any convenient lineal scale, the known vertical forces. Then, by taking the joints A, D, etc., in order, and forming on ak polygonal figures with their sides parallel to the direction of the forces acting at each of these joints, their magnitude also may be obtained by actual measurement of the corresponding lines. It frequently happens in large roofs that the loads are not concentrated at the joints, but are distributed at short intervals along the principal rafters (as in Figs. 23 and 24). In such cases the rafters themselves must be calculated as beams, so as to withstand the transverse stress involved; while the load on the joint is taken to include half that borne by each adjacent portion of rafter. The struts or compression members in a roof truss or other braced structure are usually designed as columns with fixed ends, they being of a relative length and stiffness, which precludes their being considered as metal under a simple compressive stress, as in the upper flange of a girder.

The stresses being found on each part of a beam, column, or braced structure, it is easy to provide sufficient metal to withstand them without being strained beyond the limit of safety. This is usually taken as from 4 tons to 5 tons per sq. in. for wrought iron, and from 5 tons to 6 tons for steel. In large structures a slightly higher stress is allowable, as the elasticity of the whole tends to prevent failure in any one part. Cast iron will stand a compressive force of 6 tons per sq. in., but a tensile stress of barely one quarter that amount.

Beams.—The simplest form of beam is the steel joist (Fig. 14), rolled into shape at one operation. The greatest thickness of flange-metal rolled is 1 in., and the least $\frac{1}{2}$ in., the thickness of web usually being about half this, but never reduced to less than $\frac{1}{8}$ in. Girders which require greater strength than this higher limit allows of are built up of steel plates, the web and flanges being united by means of angle-bars (Fig. 11), and the whole structure riveted together. The simplest form of plate-girder is shown in section in Fig. 15. This type is capable of amplification within wide limits by the addition of further plates to the flanges, as well as by increase in the dimensions. For practical purposes it is inconvenient to have the plates thicker than $\frac{3}{8}$ in. or thinner than $\frac{1}{4}$ in.; while their economical length is

usually limited to 15 ft. In girders longer than this cover-plates are introduced. These, when single, are the same thickness and width as the main plates, and are riveted to them on each side of the joint. As there is a tendency for the web-plate to buckle or bend under the shearing stress, it is strengthened at intervals by vertical stiffeners of tee-bar (Fig. 12), which are either 'joggled' over the angles, as in Fig. 15, or bent across them and riveted to the flanges. In girders which have to sustain heavy loads, the flange-plates are increased in number towards the centre of the span; while the web-stiffeners are less widely spaced towards the points of support, shearing stress being most felt there. Box girders are constructed with two parallel webs, connected to the same upper and lower flanges; in small girders they are often built up of a pair of channel-bars (Fig. 13), riveted to the flange plates. They have certain advantages of increased stiffness and slight economy of metal over the ordinary single-web type; but, unless made so large that they can be entered to clean and paint, they are particularly liable to corrosion on their internal surfaces. In lattice girders the continuous plate web is replaced by a system of struts and tie-bars, which form a braced framework, connecting and keeping apart the flanges, or booms, and communicating the shearing stress from the centre of the girder to each point of support. Lattice girders are extensively used for covering wide spans, where a plate girder would be unduly heavy, and also in many positions for the sake of a light and graceful appearance. A usual method of obtaining the necessary increase of strength in the centre of the span is to curve the upper boom of the girder, so that its depth is greater in the middle than at the ends. In the cantilever, on the other hand, the flange stresses increase towards the point of fixing (and support). To this fact, as well as to the pleasing effect produced, is due their usual form—a curved taper towards the extremity. Cantilevers which are larger than mere brackets are almost invariably of the lattice type, and come more under the head of braced structures than of simple beams.

Columns.—The simplest types of columns are of cast iron. The usual form is that of a hollow cylinder, the diameter being from one-twentieth to one-twenty-sixth the length, and the thickness of metal not less than one-twelfth the diameter. Cast-iron columns are moulded with a heavy base-plate, and frequently also with spreading capitals of a more or

less ornamental design. Owing to the difficulty of forming connections with longitudinals, and to that of bracing them effectually against side pressure, their use is generally restricted to bearing a direct vertical load, such as the principals of a roof or the girders of a bridge. Other types are also preferred for columns of any considerable height. For carrying the superstructure of railway stations, market halls, and other buildings of public resort, cylindrical cast-iron columns are particularly suitable.

Steel columns are formed of the ordinary sections of rolled bars and joists, or are built up in a manner similar to that of a plate girder. Fig. 16 shows a rolled joist used as a column, and supporting two similar joists (employed as beams), which carry a brick wall. The top and bottom of the vertical joist are riveted by means of angle-bars on to horizontal bearing-plates, these respectively receiving and distributing the load. The beams are connected by bolts, running through cast-iron distance-pieces, which stiffen the combined structure. Various simple types of built-up columns are shown in section in Figs. 18 to 21. The first is composed of a joist and two plates, the next of two channel-bars and two plates, that in Fig. 20 of three joists, and that in Fig. 21 of four segmental plates, riveted together at their flanges and forming a circular section. By means of combinations and modifications of these types, a large variety of sections can be arrived at. For high columns with a light load, the section shown in Fig. 19 may be modified by replacing the plates with open lattice-work (Fig. 17); or two joists may be similarly connected by diagonal bracing, whereupon a light and pleasing effect is obtained without the sacrifice of stiffness or strength. The resistance of columns to external loads being greater if their ends are fixed, it is a usual practice to bolt down the base-plates on to a substantial foundation of concrete or masonry. In the case of high columns it is advisable to splay out the lower ends to a wide base, both for the sake of affording a better leverage to the holding-down bolts, and of transmitting the vertical pressure over a greater area of foundation. Columns of cast iron, wrought iron, and steel are extensively used to form the supports of piers on the sea coast, particularly of those which are designed for use as promenades and landing-places for pleasure-steamers. Piers on which heavy traffic has to be carried, or alongside of which steamers may have to lie in rough

Bending Moments.

A. Cantilever, (fixed at one end) loaded at one point.

Fig. 1.

B. Cantilever, load distributed.

Fig. 3.

C. Beam, supported at both ends, loaded at centre.

Fig. 5.

D. Beam, load distributed.

Fig. 7.

Shearing Moments.



Fig. 2.

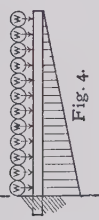


Fig. 4.

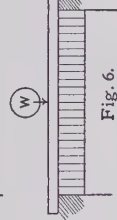


Fig. 6.

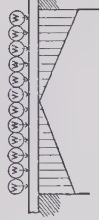
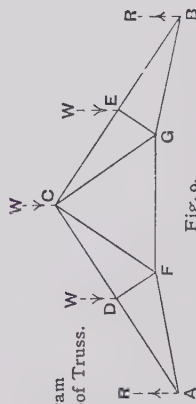
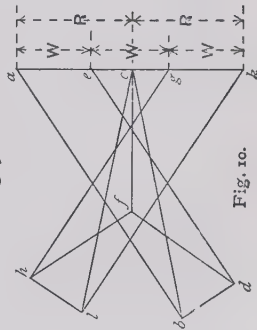


Fig. 8.



Frame Diagram of Simple Roof Truss.

Fig. 9.



Stress Diagram corresponding to above figure.

Fig. 10.

Angle Bar.



Tee Bar.

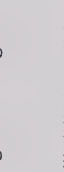


Fig. 11.

Fig. 12.

Channel bar.



Fig. 13.

Fig. 14.

Rolled Joist.

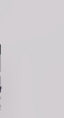


Fig. 15.

Rivetted Girder.

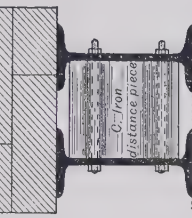
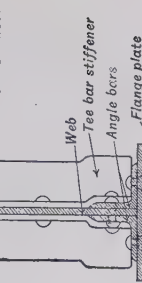


Fig. 16.

Beam and supporting column of rolled joists.

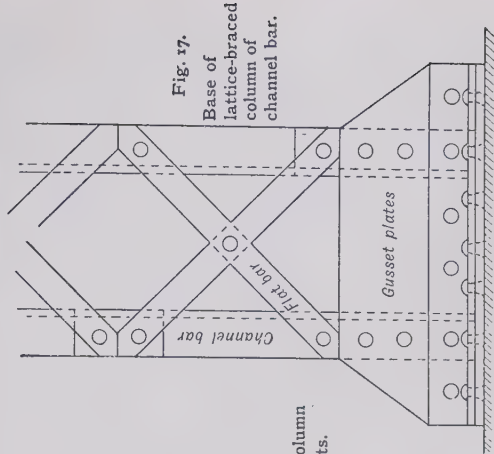


Fig. 17.

Base of lattice-braced column of channel bar.

Sections of Steel Columns.

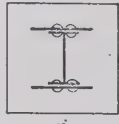


Fig. 18.

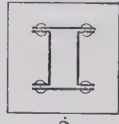


Fig. 19.

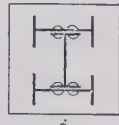


Fig. 20.

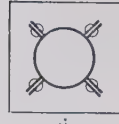


Fig. 21.

weather, are more suitably constructed of stone or concrete. The columns are usually cylindrical, hollow if of cast iron, solid if of wrought iron or steel. Unless the bottom is of unyielding rock, the columns are formed into screw-piles by the addition of threaded points, and are screwed down into a secure position by means of a capstan. A system of light diagonal bracing is then erected between them in each direction, so that a firm structure is obtained for the support of the upper cross-beams, longitudinals, and flooring.

The high buildings which, whether for use as offices or residential flats, are becoming so marked a feature of modern cities, frequently consist of a framework of steel, enclosed in a mere shell of outer wall. In England these are rarely of more than five or six stories; a part also of the structure often consists of solid, weight-bearing wall, which prevents the steel framework from being regarded as a complete system of support. In America, however, and typically in New York and Chicago, such buildings contain as many as thirteen or fourteen stories; and the whole weight is borne, and due stiffness maintained in all parts, by a series of steel columns continued for the entire height, and connected by a system of built-up girders. The columns are, as nearly as possible, spaced evenly over the floor area of the building, and situated at the junctions of main partitions and walls. The main girders, whether resting on brackets or merely bolted to the columns, are attached rigidly to them, thus composing a framework adapted to resist all vertical pressures. The question of stiffening the structure against side pressures, such as that caused by wind, is less easy of solution, owing to the interruption of the doors and windows. The difficulty is in some buildings partially overcome by so designing the interior as to leave certain walls, enclosing a definite area, blank from top to bottom of the structure, or only pierced by comparatively small doors in restricted positions. This contrivance leaves the walls free for the insertion of diagonal bracing in the form of crossed tension and compression bars, thus stiffening a vertical shaft which imparts rigidity to the whole building. Another device, more usually adopted, though less efficacious, consists in spreading out the ends of the main girders by means of lattice bracing, this being fastened to the columns above and below the area of main support. The columns are built up of plates

and rolled bars, riveted together so as to form a hollow section; and the interior serves to convey service and water pipes and electric cables from upper to lower floors. Space which is not utilized for these requirements is usually filled with concrete, to prevent corrosion of the metal. The main girders, which are built up of plates riveted together in the ordinary manner, carry the superincumbent walls and the floor supports. The latter usually consist of rolled joists, connected by slabs of concrete or flat 'jack' arches of brickwork. All steel work is finally cased in terracotta (for outside walls) or in thin layers of cement concrete, both materials being able to withstand the great heat of a conflagration, and thus rendering the building fireproof. Uncovered steel and iron, on the other hand, conduct heat readily from one part of the structure to another, and are themselves liable to crippling or deformation.

Braced Structures.—Under this head may be included those particular forms of girders, cantilevers, and columns in which the place of the web, or distance-plate, is taken by a system of open lattice bracing, designed to resist compression and tension in its alternate members, and communicating transverse stresses to the points of support. The more particular use of the term, however, refers to jointed frames of steel in which there are no continuous flanges (as in the girder), but which may be taken as (theoretically) free to move at each joint, equilibrium being maintained by the correct design and adjustment of every part. The most universal example of this principle is seen in roofs of steel and wrought iron.

Roofs.—The principles involved in the framework of roofs are similar to those which govern the design of bridges; all steel roofs are modifications of the lattice girder or the arch. The latter gives opportunity for greater artistic effect; the former is more generally applicable, in what are known as trussed roofs, for covering buildings of moderate width. Even large railway stations, for which thirty years ago a high arched roof traversing the whole width of rails and platforms was considered advisable, are now usually constructed with a series of pointed roofs, carried on trussed principals, and supported by rows of intermediate columns. The Great Central Railway terminus in London offers an example of this.

The simplest roof-truss, shown in Fig. 22, consists of two straight rafters, usually formed of tee-bars, which carry the purlins and

ridge-piece. Each rafter is trussed by means of a short strut supporting it in the centre, and the lower end of this is sustained by tension-rods connecting it with the ends of the rafter. The rafters are joined (at the top) by a gusset-plate, and the struts by a fifth tension-rod, which ties together the whole principal, and is tightened up by a union-screw at its centre. This type of roof is suitable for spans up to 40 ft. For those of from 40 ft. to 60 ft. a modification, as shown in Fig. 23, is adopted. In this pattern two subsidiary struts support the rafter at intermediate points, and are held by tension-rods in a manner similar to that of the main truss. An additional tie, otherwise performing no active duty, holds up the centre of the main tension-rod to prevent it from sagging. For spans of from 50 ft. to 100 ft. some form of queen-roof is most commonly adopted. The type in which the struts are normal to the rafter is shown in Fig. 24; the alternate arrangement is to incline the struts so that the two in the centre meet under the apex of the roof, while the tension-rods are vertical and horizontal, or nearly so. The first pattern is better, in that the compression members are shorter, and have thus less tendency to buckle. Both, however, are in general use. In all these trusses the rafters are usually formed of tee-bars, strengthened if necessary by a plate riveted to the wider flange, which is placed uppermost. The struts may be of angle-bar, of two tee-bars riveted together, or of two flat-bars kept a few inches apart by cast-iron distance-pieces, through which the connecting bolts or rivets pass. The tension-rods are round bars, flattened at the joints, or double flat-bars of small section. Joints at the apexes of rafters, and at the junctions of rafters with their supporting struts, are usually considered as rigid, and are formed with rivets or bolts, the former being used for those joints which can be made on the ground, prior to the final erection, or which are in easily accessible positions. Joints at the meeting of tension-rods and struts depend for their connection on a single cylindrical pin, which passes through holes drilled in their ends, and which, while sufficiently tight to exclude play, does not form such a rigid joint as to prevent the members from turning slightly on it.

Intermediate between the trussed principal and the arch comes the bow-string type of roof. In this the rafter has one segmental curve throughout; all outward thrust upon the walls

is taken up by a tie-rod of flatter curve, connected to the rafter by diagonal bracing of alternate struts and tension members. An example of this type (shown in Fig. 25) is the roof of New Street Station, Birmingham. The principal rafter, in form a wrought-iron girder 15 in. deep, has a rise of 40 ft. 6 in. on a span of 212 ft. The tie-rod, a 4-in. diameter round bar, rises only 17 ft., thus giving a depth of 23 ft. 6 in. to the centre of the principal. The tension members of the bracing consist of flat-bars, from 3 in. to 5 in. in width; the struts, of four angle-bars, arranged so as to give a cruciform section. The joints on the main tie-rod are formed of wrought-iron boxes; the sections of the tie-rod are screwed into the ends of these, and the plates and angles of the bracing are bolted to their sides. The bow-string pattern is that most generally adopted for wide-span roofs, as, being self-contained, it is particularly adapted for resting on columns or high walls.

Arched roofs, on the other hand, are incomplete in themselves, and must be provided with some external aid to counter-balance their outward thrust. For small roofs strong walls may be sufficient to act as abutments and preserve the stability of the building. For wider spans tie-rods are sometimes employed to hold in the feet of the arched principals, either at the surface of the ground, as in Fig. 25, or on a higher springing level; in the latter case the ties are usually suspended by light vertical rods from the arch. St. Pancras railway station (London) roof, of 240 ft. span, is an example of the tied arch, the ties crossing underneath the platforms and rails. The most famous example of an arched roof is that over the machinery hall of the Paris Exhibition of 1889 (Fig. 26). The principals of this span a clear width of 375 ft., and are constructed on the hinged-arch principle, being jointed at their (pointed) apexes and at each springing. All accidental stresses, due to expansion of the metal, wind-pressure, etc., are avoided by this means. No tie-rod or abutment-wall is necessary, as the arches spring directly from the ground, in which substantial concrete and masonry foundations are constructed. This roof is of steel throughout, whereas the earlier examples mentioned were constructed of wrought iron. In such a roof as the last mentioned, the purlins, or longitudinal roof-bearers, are lattice-girders of considerable depth and strength. Where, however, a large area has to be roofed over, without the necessity for such architectural

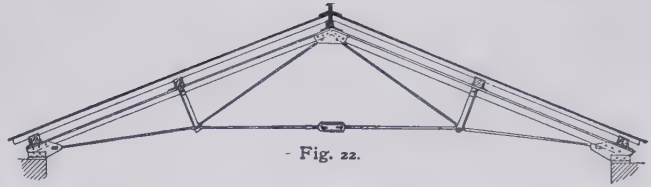


Fig. 22.

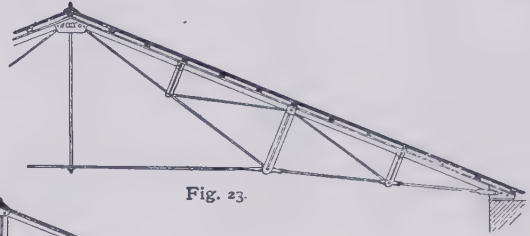


Fig. 23.

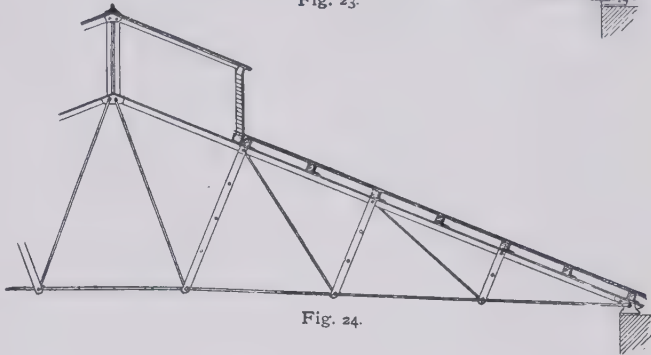


Fig. 24.



Fig. 25.



Fig. 26.

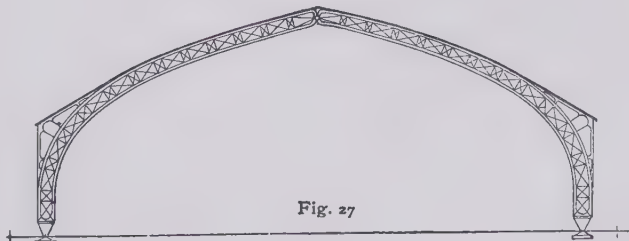


Fig. 27

Steel and Iron Construction.—II.

(For explanation, see text.)

effect as is obtained by the use of long, curving principals, a usual method is to cross the main spans with lattice-girders, on which rest a series of transverse roofs of small span. By this means long and heavy rafters may be avoided and considerable economy effected. One end only of large girders or roof principals must be fixed, the other end resting on rollers or on a smooth plate on which it is free to slide. Otherwise the expansion and contraction of the metal, due to changes of temperature, will introduce unlooked-for stresses in the members of the structure, and tend to cause distortion or failure.

Domed roofs are formed of a series of arched ribs, converging to a common meeting-point at the apex of the dome. The lower ends of the ribs may be supported by an abutment-wall sufficiently strong to withstand their thrust; or, more usually, they are held in by ties which pass round the base of the dome, thus forming a polygonal framing with angular joints corresponding in number and position to the ribs.

Lighthouses are frequently constructed of steel and iron. In cases where it is impossible to erect subsidiary buildings, the main tower is usually covered throughout with iron plates. Otherwise a central shaft (of about 6 ft. diameter, and containing a spiral staircase) is alone enclosed, the remainder of the tower consisting of an open-work braced structure which offers the minimum amount of resistance to wind and sea. The most usual type is composed of a number of exterior columns of small diameter, strongly braced together, and connected by an additional series of diagonals with the central shaft. The external form of the tower is that of a pillar (of polygonal section), tapering upwards towards the lantern, and spreading out at the base with a curved profile. If the foundations are of an unstable character, the lighthouse may be carried on screw-piles, similar to those used for supporting the superstructure of piers. The Eiffel Tower, constructed for the Paris Exhibition of 1889, is typical, on an exaggerated scale, of high-braced structures. It is 1,000 ft. in height to the summit of the lantern. It is composed of four giant columns, curving upwards from an extended base, and connected by belts of girders at the different stories. At the top of the tower the columns unite, and are rigidly joined by a system of diagonal bracing; the curve of their profiles is such that no previous transverse bracing (to re-

sist wind-pressure) is necessary, and the columns are practically independent of one another up to this point. The columns rest on four isolated foundations, occupying the angles of a square, the sides of which are in length about one-third the height of the tower. Masonry piers, built for their support, extend to a depth of from 20 ft. to 35 ft. below the ground, and rest on masses of concrete, each over 600 sq. ft. in area. The columns are of rectangular section, the standards at each angle being built up of plates, with sides 31 ins. in width at the base. Each standard rests in a cast-iron shoe, and that again on a cast-iron bed-plate, the whole being bolted together and secured by means of strong holding-down

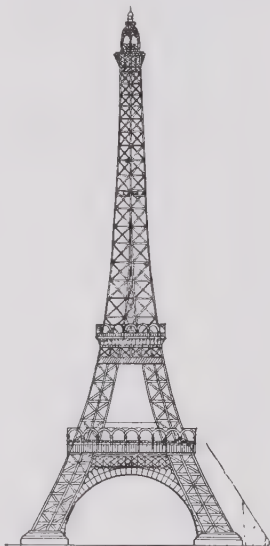


Diagram of Structure of the Eiffel Tower.

bolts to the masonry piers. The cross-bracing of the columns is formed of open-work lattice ties and struts, riveted by means of gusset-plates to the standards and to one another, and forming, in the interior of each column, a network of interlacing members. The arches which span the openings in the base of the tower are merely for ornamental purposes, and perform no useful work in strengthening the structure as a whole. The entire framework of the tower is composed of wrought iron, of which a total weight of 7,300 tons was used in its construction. See *Notes on Building Construction*, vol. iii. (5th ed. (1902), Wray's *Instruction in Construction* (1891), Baker's *Beams, Columns, and Arches* (1892), Rankine's *Civil Engineering* (1900),

Unwin's *Iron Bridges and Roofs* (1869), Molesworth's *Pocket Book*.

Steele, FLORA ANNIE (1847), English novelist, born at Harrow, was for some time inspectress of government and aided schools in the Punjab, and member of the Educational Committee. Among her novels, which mainly deal with Hindu or Mohammedan life and character, are *From the Five Rivers* (1893), *The Potter's Thumb* (1894), *Tales from the Punjab* (1894), *Red Rowans* (1895), *In the Tideway* (1896), and *In the Guardianship of God* (1903).

Steele, SIR RICHARD (1672-1729), English essayist and playwright, was born in Dublin. In 1695 he got a commission in the Coldstream Guards, and subsequently became a captain in Lord Lucas's Fusiliers. In 1707 he was appointed editor of the *London Gazette*, and in 1706 he became a gentleman-in-waiting to Queen Anne's husband, Prince George of Denmark. As 'Isaac Bickerstaff'—a pseudonym appropriated from Swift—he issued, on April 12, 1709, the first number of the *Tatler*, which appeared thrice weekly till Jan. 2, 1711. In 1710 Steele became commissioner of stamps. In March 1711 came the first number of the *Spectator*, which appeared daily till Dec. 6, 1712. Steele's imaginary club in the initial number includes the first sketch of Sir Roger de Coverley, and of the total 555 papers in the periodical, 236 are his. Both in the *Tatler* and the *Spectator*, as well as in the *Guardian* (March 7 to Oct. 1, 1713), he was powerfully supported by Addison. In his character sketches, social delineations, and critical discussions, Steele evinces quick observation, literary insight, and easy and virile grip of his theme; and if his form is sometimes loose even to crudeness, his treatment is at any rate invariably fresh and enjoyable. In the *Guardian* Steele diverged into politics, and in 1713 he published a pamphlet entitled *The Importance of Dunkirk Consider'd*, which provoked Swift's slashing retaliation, *The Importance of the 'Guardian' Consider'd*. In the same year Steele became M.P. for Stockbridge, resigning his post as commissioner of stamps. The *Guardian* was now dropped for the frankly political *Englishman*, which ran to fifty-seven numbers (1714). No. 26 gives the account of Alexander Selkirk which probably suggested *Robinson Crusoe*. Through his sponsorship for William Moore's work, *The Crisis* (1714), with reference to the Hanoverian succession, Steele not only prompted Swift's brilliant *Public Spirit of the Whigs*, but com-

passed his own expulsion from the House of Commons (March 1714). The death of Queen Anne presently restored his fortunes, with those of his party. He wrote *Mr. Steele's Apology for Himself and His Writings*, and he became deputy-lieutenant for Middlesex and surveyor of the royal stables at Hampton Court. Meanwhile the curious *Ladies' Library* (frequently mentioned in the *Spectator*), *The Lover*, and *The Reader* represented his zeal as projector of periodicals. In 1715 he became patentee of Drury Lane Theatre, was elected M.P. for Boroughbridge, Yorkshire, and received knighthood at the hands of George I. Through his political paper,



Sir Richard Steele.

the *Plebeian*, Steele in 1719 stirred the opposition of Addison, who assailed him in the *Old Whig*. In 1722 Steele produced in Drury Lane *The Conscious Lovers*, his most successful comedy. Genial, impulsive, improvident, Steele holds a distinguished place in letters as pioneer of the modern English essay. Mr. Austin Dobson prepared an excellent Monograph for the English Worthies Series (1886); and Mr. G. A. Aitken produced an exhaustive Biography in 1889, and edited Steele's *Plays* in 1894.

Steel Engraving. See ENGRAVING.

Steell, Sir John (1804-91), Scottish sculptor, was born at Aberdeen and apprenticed in Edinburgh as a wood-carver. Having studied sculpture in Rome, on his return he modelled the group of *Alexander Taming Bucephalus*. Most of his work is in Edinburgh—e.g. the statue of Scott in Scott's monument, the statue of Queen Victoria on the Royal Institution, the statue of Wellington before the Register House, and the *Albert Memorial* in Charlotte Square.

Steelton, bor., Dauphin co., Pennsylvania, U.S.A., on the Susquehanna, 3 m. below Harrisburg; produces principally iron and steel. Pop. (1900) 12,086.

Steelyard. See BALANCE.

Steen, Jan (1626-79), Dutch painter, called the *Molière* of painting for his dramatic and intellectual qualities. His genial, tolerant expression of life is touched with Hogarthian satire; his best work is masterly in technique and harmonious colouring. The son of a Leyden brewer, he studied under Knupfer, Adrian von Ostade, and Van Goyen. As tavern-keeper he had opportunities of studying life and gratifying intemperate habits. His best work is in Holland and England.

Steen, Johannes Vilhelm Christian (1827-1906), Norwegian statesman; tutor at the Latin school at Bergen (1850), rector at Stavanger (1866). In 1854 he founded the Radical paper *Bergensposten*; in 1859 he was elected a member of the Storting, and eventually succeeded Sverdrup as Radical leader. In March 1891 Steen was entrusted with the formation of a new ministry, but resigned in 1893. His policy was antagonistic to Sweden. He was again premier from 1898 to 1902.

Steenstrup, Johannes Christopher Hageman Rheinhardt (1842), Danish historian, born at Sorø, and since 1877 professor of Scandinavian antiquities at Copenhagen. He has written *Studier over Kong Valdemars Jordebog* (1873), *Normannerne* (1876-86), *Den danske Bonde og Friheden* (1888), *Historieskrivningen i Danmark i det 19 Aarhundrede* (1889), *Danmark's Riges Historie* (1898).

Steenwijk, tn., Netherlands, prov. Overijssel, 25 m. by rail N. of Zwolle. Close by are the national pauper colonies Frederiksoord, Wilhelminasoord, and Willemsoord. Pop. (1900) 5,591.

Steeplechasing, originally a trial of speed and jumping powers between two or more horses from one church steeple to another. During the reign of James I, there was some sort of steeplechasing at Newmarket, but details are wanting. There is a record of an Irish steeplechase match in 1752, and to Ireland is due the popularity of the sport. Forty years later the first steeplechase, with more than two starters, was run in Leicestershire, over a course from Barkby Holt to Billesdon Coplow and back, a distance of about eight miles. In the same year (1792) a steeplechase match took place, also in Leicestershire, for 1,000 guineas, between a horse belonging to Lorraine Hardy and the best hunter that the Hon. Mr. Willoughby (afterwards Lord Middleton) could procure. The course was from Melton Mowbray

to Dalby Wood, a distance of at least nine miles.

There would appear to have been no regularly organized steeplechasing until Thomas Coleman of St. Albans arranged the first regular meeting on March 1, 1831. St. Albans steeplechases have long since died out of the calendar; but at Liverpool, or rather Aintree, a suburb of that city, the Grand National, run about the last week in March, is still the great cross-country race of the year. The first 'great' steeplechase at Aintree took place on Feb. 24, 1839. The old type of steeplechase horse (*i.e.* the improved hunter) is almost a creature of the past, and the east-off from flat-racing—the speedy 'weed,' the roarer, and the rogue—have taken his place. Since the National Hunt Committee took the sport in hand, in 1866, steeplechasing has, however, been greatly reformed. The ruling committee, however, established regulation fences, periodically inspected by an official appointed by themselves; but these fences have had the effect of discouraging the owner of the *bomb-fide* 'hunter' from entering his horse. In fact, the only event in the cross-country yearly programme in which more than passing interest is taken now is the Grand National, a race worth annually something like £2,000 to the owner of the winner. In Ireland, however, there is quite as much interest and excitement in a leaping-race as ever. The nature of the soil permits chasing nearly all the year round, and a large majority of the best jumpers are still bred in that country. See *Steeplechasing* (1889), Badminton Library Series, by A. Coventry and A. E. T. Watson; *Racing and Chasing*, by A. E. T. Watson (1897); *A History of Steeplechasing* (1901), by William Blew; *The Turf* (1898), by A. E. T. Watson; *The Great Game* (1900), by Edward Spencer; *The Steeplechase Calendar* (annual); and *Ruff's Guide to the Turf* (annual).

Steer, P. Wilson (1860), English impressionist landscape and figure painter, born at Birkenhead. The strongest influence in the development of his talent was the work of the French artists Monet, Pissarro, and Cézanne, who were experimenting to solve the problem of suggesting movement in light and atmosphere by the juxtaposition of spots of pure colour, unmixed, called the *pointillist* method. He became the foremost pointillist in England, and from this method his maturer work has grown. He is an important member of the English Art Club, formed for the encouragement of independent, experimental, non-academic painting.

Steevens, GEORGE (1736-1800), English Shakespearean scholar, was born at Poplar, London. His first publication was a reprint from the original quartos of *Twenty of the Plays of Shakespeare* (1766). He made the acquaintance of Dr. Johnson, and the two collaborated in an edition of *Shakespeare's Works*, with annotations (1773), almost entirely of Steevens. His life was embittered and his friends alienated by his satiric habit of speech.

Steevens, GEORGE WARRINGTON (1869-1900), English journalist, who died from typhoid fever during the investment of Ladysmith by the Boers in the war of 1899-1902. He joined the staff of the *Pall Mall Gazette* in 1893, and retired with Mr. Henry Cust, the editor, in 1896. During the leisure which followed he wrote a book on *Naval Policy* (1896), and also *Monologues of the Dead* (1896). He was sent to America by the *Daily Mail* in 1897, and he went 'special' for it to Thessaly, Egypt, the Sudan, India, Germany, Rennes (Dreyfus), and finally to South Africa, and in almost every case the vivid letters he wrote reappeared in book form. In this way he published *The Land of the Dollar* (1897), *With the Conquering Turk* (1897), *Egypt in 1898*, *With Kitchener to Khartum* (1898), *In India* (1899), *The Tragedy of Dreyfus* (1899), and *From Cape-town to Ladysmith* (1900).

Stefan's Law, a rule connecting radiation with temperature, empirically deduced by J. Stefan of Vienna in 1879. It defines the gain of emissive intensity to be proportional to the fourth power of the absolute temperature of the hot body, assumed to be a perfect radiator. This law, supplied with a theoretical basis by Boltzmann and Planck, has proved eminently serviceable in researches into the solar temperature.

Steffens, HENRIK (1773-1845), philosopher, naturalist, and poet, born at Stavanger in Norway; became in 1797, at Jena, a disciple of Schelling, and taught at Copenhagen (1802-4), Halle, Breslau (1811-31), and Berlin (1831-45). His lectures in Copenhagen mark the beginning of the romantic movement in Denmark, and made a great sensation. His chief works are *Anthropologie* (1824), *Von der falschen Theologie und dem wahren Glauben* (1824), *Nachgelassene Schriften* (1846). See Petersen's *Henrik Steffens* (1884), Tietzen's *Zur Erinnerung an Henrik Steffens* (1871), and Steffens's own autobiography *Was ich erlebte* (1840-45), his best work.

Stein, CHARLOTTE VON (1742-1827), friend and correspon-

dent of Goethe, born at Weimar. For a long time their correspondence was interrupted, but the friendship was afterwards renewed. Three series of Goethe's letters to Frau von Stein were published in 1848-51, 1883-5, and 1886. Her letters to Goethe, long supposed to be destroyed, have recently been recovered in part. See Duntzer's, *Charlotte von Stein* (1874), Hofer's *Goethe und Charlotte von Stein* (1878), and Adler's *Goethe und Frau von Stein* (1887).

Stein, HEINRICH FRIEDRICH KARL, BARON VOM (1757-1831), Prussian statesman, born at Nassau; entered the Prussian public service in 1780, and by 1796 was president of the Westphalian Chambers. In 1804 he was called to administer the department of trade and manufactures, where he introduced various reforms; but King Frederick William III. disapproved of his reforming zeal, and Stein resigned (1807). He was, however, recalled a year later and given a free hand to carry out his plans. He abolished some of the more glaring survivals of feudalism, promoted freedom of trade, and encouraged military reform. His energy and foresight alarmed Napoleon, who obtained his dismissal. Stein, repairing (1812) to St. Petersburg, devoted himself to consolidating the league against Napoleon. After the Congress of Vienna, Stein withdrew to his estates and founded the society which has published the *Monumenta Germaniae Historica*. His political doctrines appear in his *Politischen Testament* and in his 'Tracts.' See Pertz's *Leben des Ministers Freiherrn vom Stein* (6 vols. 1849-55), Seeley's *Life and Times of Stein* (3 vols. 1878), and Max Lehmann's *Freiherr vom Stein* (1902).

Stein, LORENZ VON (1815-90), German economist and writer on politics, was born at Eckernförde in Schleswig. Professor at Kiel (1846-52) and at Vienna (1855-85), he wrote on French social and political history, and *System der Staatswissenschaft* (1852-7), *Lehrbuch der Nationalökonomie* (1887), *Verwaltungslehre* (1865-84), and *Die Frau auf dem Gebiet der Nationalökonomie* (1875).

Steinbok (*Nanotragus campestris*), a small (under two feet) S. and E. African antelope, in which the horns of the male rarely exceed four inches. To the same genus belong a number of other African species, notably *N. pygmaeus*, the royal antelope, which only stands one foot high at the shoulder, and is the smallest living ruminant.

Steinen, KARL VON DEN (1855), German traveller and ethnologist, born at Mülheim-an-der-Ruhr;

made a voyage round the world (1879-81); was naturalist of the German expedition to S. Georgia (1882), and in 1884-5 explored the province of Matto Grosso in Brazil, making the first modern descent of the river Xingú, a most important piece of exploration. In 1897-8 he explored the Marquesas Islands, and in 1900 was appointed assistant-director of the royal museums in Berlin. He has published *Durch Zentralbrasilien* (1886), and *Unter den Naturvölkern Zentral-Brasiliens* (1894).



Steinbok.

Steinitz, WILLIAM (1837-1900), chess-player, was born at Prague, and joined the staff of the *Constitutionelle Oesterreichische Zeitung*. He devoted his leisure hours to chess, in which he subsequently beat every great player except Morphy and Staunton, whom he never met. For some years he edited the chess column of the *Field*, and after 1884 resided in the United States.

Steinkirk, or **STEENKERKE**, vil., prov. Hainault, Belgium, on the Seine, 5 m. N. of Soignies. Noted for battle (1692) in which Marshal de Luxembourg defeated William III.

Steinmetz, KARL FRIEDRICH VON (1796-1877), Prussian general, born at Eisenach, entered Paris with the allied armies (1815). He was in command of the Prussian army which gained victories over the Austrians at Nachod, Skalitz, and other places (1866), and was at the head of the first army which invaded France, contributing to the great victory near Metz (1870); in the same year he was deprived of his command as the result of his failure at Gravelotte; and was appointed governor-general of Posen and Silesia.

Steinthal, or **BAN-DE-LA-ROCHE**, a valley of the Vosges Mts., Lower Alsace, scene of the labours of Pastor Oberlin (1740-1826).

Steinway and Sons, New York firm of pianoforte makers, founded in 1853 by Henry Steinway (Steinweg) and his sons, Charles, Henry, William, and Albert; Theodore, the eldest son, joined the firm in 1865. They

were natives of Brunswick, but emigrated to New York in 1849.

Stella. See SIDNEY, PHILIP, and SWIFT.

Stellaland, dist. of some 6,000 sq. m., Bechuanaland, S. Africa, s.w. of the Transvaal; was a Boer republic from 1882 till 1884, and in 1885 was divided between the Transvaal and British Bechuanaland.

Stellaria, STITCHGRASS, STITCHWORT, or STARWORT, a genus of herbaceous plants belonging to the order Caryophyllaceæ. Their flowers have five distinct sepals, five petals deeply two-cleft, ten stamens inserted into a ring beneath the capsule, and three styles. The greater stitchwort



Greater Stitchwort (*Stellaria holostea*).

1, Androecium and pistil; 2, dehiscent fruit.

(*S. holostea*) is one of the most beautiful flowers of early summer hedgerows; it has long stems, and its flowers are satiny white. The lesser stitchwort (*S. graminea*), which blooms later, is much smaller and less conspicuous. *S. media*, the chickweed, is a very common annual weed, bearing its small white flowers nearly the year through. A yellow-leaved variety of the lesser stitchwort (*S. paminea aurea*) is sometimes grown in gardens.

Stellenbosch, cap. of dist. of same name, Cape Colony, British S. Africa, 21 m. by rail. E. of Cape Town; centre of a wine district, and seat of Victoria University College. Pop. (1904) of dist. 22,269; of tn. 7,573.

Stellerine, or STELLER'S SEACOW. See RHYTINA.

Stelvio Pass (9,055 ft.) is traversed by the highest carriage-road in the Alps, constructed (1820-5) by the Austrian government. It leads from the Adige valley, above Meran, over to Bormio in the Adda valley.

Stem, the ascending axis of a plant, contrasted with the root or descending axis, bearing leaves and flowers, and in its highest development putting forth branches freely. Its ordinary functions are the elevation of the leaves, that they may be exposed to the action of the sun and air, and the transmission to them of the nutritive matters absorbed by the roots from the soil. In a transverse section of a young dicotyledonous tree the central pith, with the medullary rays diverging therefrom, the surrounding wood-layers, the cambium between the wood and the bark, and between the bundles (the interfascicular cambium) and the bast or phloem may be distinguished. Stems may be herbaceous, as in most annuals, or woody, as in shrubs and trees. The former may be erect (the technical name for which is 'caulis'); procumbent, or lying along the ground; creeping—that is, procumbent and sending off adventitious roots from the nodes; climbing, or clinging by tendrils, or twining round a support in a spiral coil. Stems may also grow beneath the surface, of which the rhizome of Solomon's seal, the corm of the crocus, the bulb of the hyacinth, and the stem-tuber of the potato are well-known examples. See WOOD.

Stenbock, MAGNUS, COUNT (1664-1717), Swedish general, was born in Stockholm; accompanied Charles XII. in his earlier campaigns, and contributed largely to the victory of Narva and the subjection of Poland. In 1710 he gained a brilliant victory over Frederick IV. of Denmark at Helsingborg, and in 1712 defeated the Danes at Gadebusch, for which exploit he obtained his marshal's baton. In 1713 he burned Altona, but was surrounded by the combined Russians, Danes, and Saxons at Tönning, and compelled to surrender with 12,000 men. He died in a Danish dungeon. See his *Mémoires* (1745), and *Life*, in Swedish, by Lillieströle (1890).

Stencilling, the art of cutting out, from sheets of metal, cardboard, or paper, spaces, as of ornaments or lettering, which are then laid upon a surface and painted through. It was common among the Egyptians and Romans. The design is first drawn on metal or cardboard, which must be all in one piece and in one colour, so as to enable the broad or spreading brush, or

'dabber,' to pass at one sweep over the whole. Stencilling is unsurpassed for the purpose of giving bold and effective ornament in antique style on walls and ceilings. It is carried out in Italy at the present day with so much care and refinement as to resemble careful hand-painting. It is extensively used to decorate furniture and the spaces between windows, also in gardens to imitate foliage. A beautiful variety of stencil work is known as 'theorems' and 'Grecian painting.' This consists of painting flowers, fruit, etc., on a damp surface by stencil. As the colours shrink and dry in different tones, the peculiar blending seen in nature is imitated.

Stendal, tn., Prussia, prov. Saxony, 33 m. by rail N.N.E. of Magdeburg. Its cathedral dates from 1188. Birthplace of Winckelmann. Pop. (1900) 22,075.

Stendhal. See BEYLE, MARIE HENRI.

Stennis, par., Orkney. See MAES-HOWE and CIRCLES OF STONES.

Steno, NICOLAUS, DAN. NIELS STENSON (1638-86), Danish physiologist and prelate, was born in Copenhagen. In 1657 he discovered the salivary canal called ductus Stenonianus, and shortly afterwards the salivary gland. He was the first to demonstrate that the heart is a muscle. Subsequently he lectured at Paris, and at Florence went over (1667) to Catholicism. Ten years later he was appointed vicar-apostolic for Scandinavia, and led the life of a saintly ascetic. He also wrote with great shrewdness on geology and crystallography. His chief works were *De Musculis et Glandulis Observationum Specimen* (1664) and *De Solido intra Solidum naturaliter Contento* (1669).

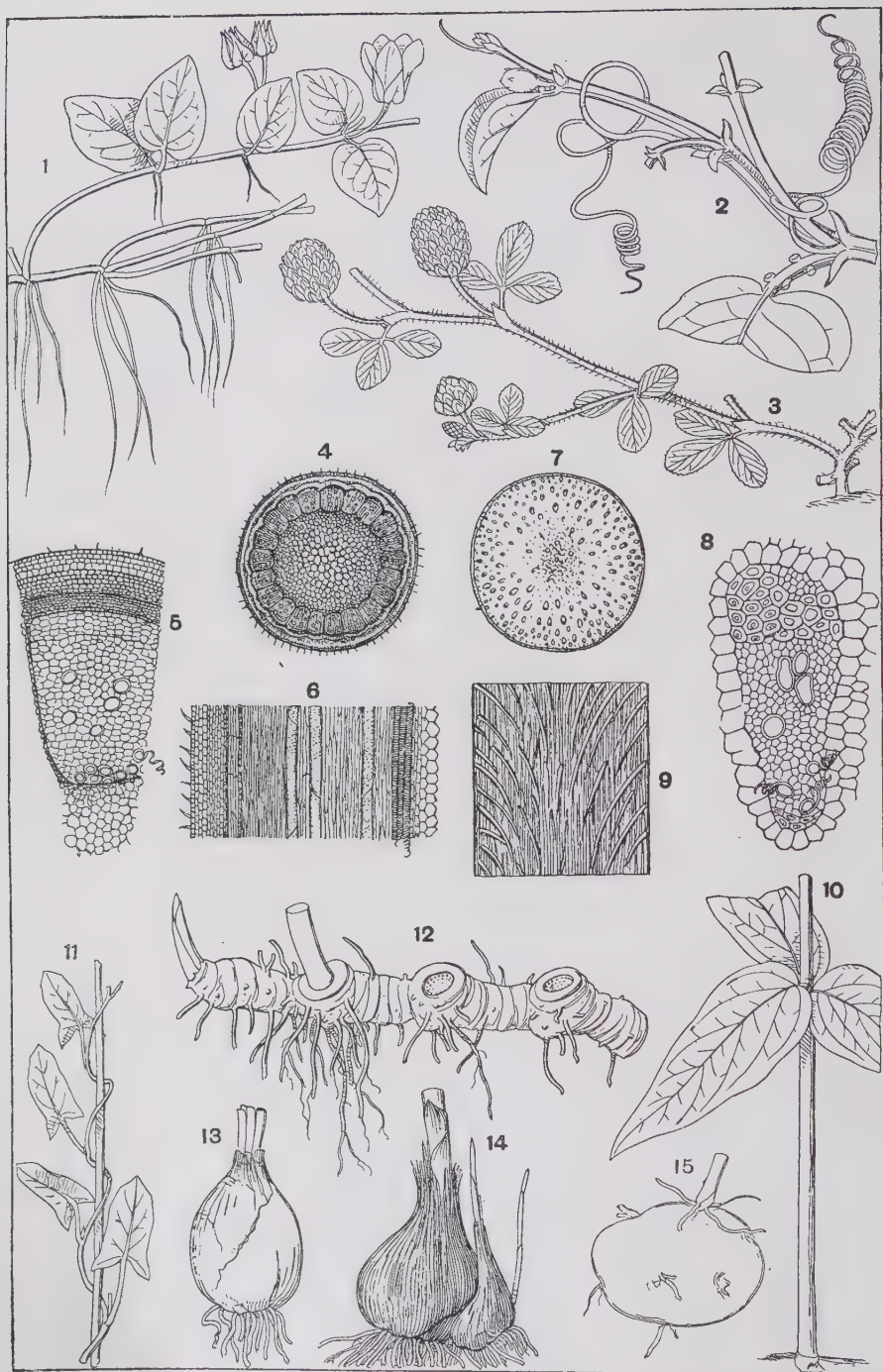
Stenography. See SHORT-HAND.

Stenson's Duct, the duct leading from the parotid gland to the inside of the cheek, where it discharges the parotid saliva.

Stentor, a herald of the Greeks at Troy, said by Homer to be able to shout as loud as fifty ordinary men together; hence proverbial for any one with a loud voice.

Step, a block for holding the pivot of an upright shaft. In earthwork, steps are excavations for the foundations of retaining walls and masonry dams, remotely resembling a stair, so as to get a firm foundation to resist certain thrusts from the structure.

Stephan, HEINRICH VON (1831-97), German statesman, born at Stolp, Pomerania. He reorganized the postal service in Schleswig-Holstein (1864); became postmaster-general of the North German Confederation (1870) and of the newly-founded empire

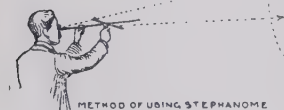
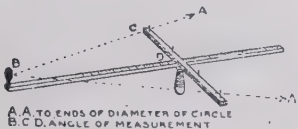


Types and Structure of Stems.

1. Creeping stem (moneywort). 2. Climbing stem (passion flower). 3. Procumbent stem (hop trefoil). 4. Dicotyledonous stem, cross section (maple). 5. Part of same, from pith to epidermis. 6. Longitudinal section of same. 7. Monocotyledonous stem, cross section (palm). 8. Vascular bundle from the same, cross section. 9. Longitudinal section of same stem. 10. Erect stem (loosestrife). 11. Twining stem (bindweed). 12. Rhizome (Solomon's seal). 13. Bulb (hyacinth). 14. Corm (crocus). 15. Stem tuber (potato).

(1871), and secretary of state for the post-office department (1878). He was the chief promoter of the International Postal Union (1874). He wrote *Geschichte der Preussischen Post* (1859), and *Das Heutige Aegypten* (1872). See Knickerbocker's *Heinrich von Stephan* (1897).

Stephanome, an instrument invented by the late Professor P. G. Tait, used at the Ben Nevis observatory for measuring the angular size of halos, glories, fog-bows, etc. It consists of a graduated rod with a sight at one end, and a sliding bar with an outer and inner pair of points. In practice the eye is applied to the sight, and the sliding bar moved along the graduated rod until either the outer or inner pair of points on it coincide with the ends of a diameter of the circle being measured. The graduations on the rod are reduced to angular measure and tabulated, measurements being made to an average accuracy of about five minutes of arc.



Stephanome.

Stephanotis, a genus of tropical twining shrubs, belonging to the order Asclepiadaceae. The species usually grown under glass in Britain, for its fragrant white flowers, is *S. floribunda*, the clustered wax flower, a native of Madagascar.

Stephen, the name of ten popes, of whom the most important were:—(1.) STEPHEN I. (d. 257), succeeded Lucius as bishop of Rome (254), and carried on a vigorous controversy with Cyprian on the baptism of heretics. (2.) STEPHEN III., sometimes called Stephen II. (752-757), solicited the aid of Pepin, king of the Franks, against the attacks of Astolphus, king of the Longobards.

Stephen, hospodar of Moldavia (1456-1504). Having annexed part of Wallachia, he in 1467 successfully defended his realm against the Hungarian monarch, Matthias Corvinus. He then routed Radul, hospodar of Wallachia, in 1474; in 1475, with the help of the Hungarians, he utterly defeated 120,000 Turks at Racova, the same year again routing Radul and the Don Cossacks. In 1477,

assisted by Stephen Bathori, he drove another immense Turkish army out of Moldavia, and deposed Radul, who had aided them. In 1481 he again routed the Turks at Rebnik. In 1484 Sultan Bayazid, in alliance with the Crimean and Volga Cossacks, ravaged Moldavia and captured the fortress of Kilia, and Stephen with difficulty obtained help from Poland by acknowledging her suzerainty. In 1497 the policy of Poland compelled Stephen to look for aid to both Turkey and Hungary, and he himself ravaged Poland.

Stephen, king of England (?1097-1154), the son of Stephen, Count of Blois, and of the Conqueror's daughter Adela. On Henry I.'s death (1135) Stephen took advantage of his personal popularity to claim the throne, as against his cousin Matilda, and was duly crowned. But by his acts he quickly alienated the sympathy of the people, and brought in Flemish mercenaries. David of Scotland invaded the north on behalf of his niece Matilda, but was disastrously defeated at Northallerton (1138). Stephen made enemies of the church and the most powerful of the nobles. In 1141 he was a prisoner in Matilda's hands, and was granted his liberty in exchange for that of Robert, Duke of Gloucester. From 1142 Stephen had it all his own way; but Matilda's son Henry came over in 1152 to pursue his rights. Stephen was glad to make peace on the basis of acknowledging Henry as heir to the throne.

Stephen, JAMES (1758-1832), master of chancery and abolitionist, was born at Poole, and went out to St. Kitts in the West Indies, where he practised law. There he was inspired with a horror for slavery, which led him to become the friend and co-worker of Wilberforce. He returned to England and engaged in practice before the prize court, entered Parliament as member for Tralee, was under-secretary for the colonies, and became master of the Court of Chancery. He was the author of various pamphlets—e.g. *War in Disguise* (1805), and of an exhaustive and eloquent treatise, *The Slavery of the British West Indies* (1830).

Stephen, SIR JAMES (1789-1859), English politician, born at Lambeth, London; called to the bar at Lincoln's Inn (1811), but in 1836 became under-secretary for the colonies. From 1836 to 1847 he 'literally ruled the colonial empire,' and his autocratic methods won him the nickname of King Stephen. In 1849, after he resigned from the Colonial Office, he was appointed regius professor of modern history at Cambridge, and published *Essays in Eccle-*

siastical History (1849) and *Lectures on the History of France* (1851). See Life prefixed to 5th ed. of *Essays*.

Stephen, SIR JAMES FITZ-JAMES (1829-94), English judge, was the son of Sir James Stephen, and was born at Kensington, London. He was called to the bar at the Inner Temple (1854), and, after acting as recorder at New-ark-on-Trent (1859-69), became legal member of the Viceroy's Council (1869-72), and judge of the High Court of Justice in India (1879-91), being created a baronet on his retirement. He published *Liberty, Equality, and Fraternity* (1873), *History of the Criminal Law of England* (1883), and *Hours Sabbaticae* (1892). See L. Stephen's *Life* (1895).

Stephen, JAMES KENNETH (1859-92), better known as 'J. K. S.,' English writer, was the second son of Sir James Fitz-james Stephen. In 1891 he published *Lapsus Calami* and *Quo Musa Tendit*, two little volumes of brilliant society verse and parody, worthy of Calverley at his best. He was tutor to the Duke of Clarence (1883).

Stephen, SIR LESLIE (1832-1904), English man of letters, born at Kensington, London. He edited *Cornhill Magazine* from 1871 to 1882, and was editor of vols. i.-xxi., joint editor with Sidney Lee of vols. xxii.-xxvi., of the *Dictionary of National Biography*, to which he contributed many excellent biographies. His book, *Hours in a Library* (1874-79), is a work of great value. The possessor of a clear, crisp style, Stephen had a wide knowledge of books and a fine critical taste, which give to his deliverances weight and authority. His most satisfactory work in this department is *English Thought in the Eighteenth Century* (1876). In 1900 an important continuation of this work appeared as *The English Utilitarians*. This book is a critical history of the progressive and reactionary ideas of the 19th century, in so far as they bear directly on ethical, political, and economic problems. To add to the value of the work, the speculative elements are set in a charming series of biographical frameworks, thereby blending in a masterly fashion the personal and the intellectual, the concrete and the abstract. Closely connected with the latter work is his *Science of Ethics* (1882), in which the utilitarian system of ethics is set forth and improved in the light of the evolutionary theory of man as expounded by Spencer and Darwin. Among his important writings are *Studies of a Biographer* (1898), a *Life of Sir James Stephen* (1895), of *Professor Fawcett* (1885); and *Lives of*

Johnson, Pope, Swift, and Hobbes in English Men of Letters. He was knighted in 1902. In 1904 appeared his *English Literature and Society in the 18th Century*.

Stephen, St. See DEACON.

Stephen, St., king of Hungary (?969-1038), originally called Vaik, was born at Gran, was converted (995) to the Christian faith, and crowned first king of Hun-

tole. He left three sons, Francis (1502-50); Charles (1504-64), who published an edition of Cicero (1555); and Robert (1503-59), who was king's printer to Francis I. (1539), but migrated to Geneva (1551), where he became a convert to Calvinism. His great works were a French Bible revised by Calvin (1553), a Greek Testament (1546), a Hebrew Bible

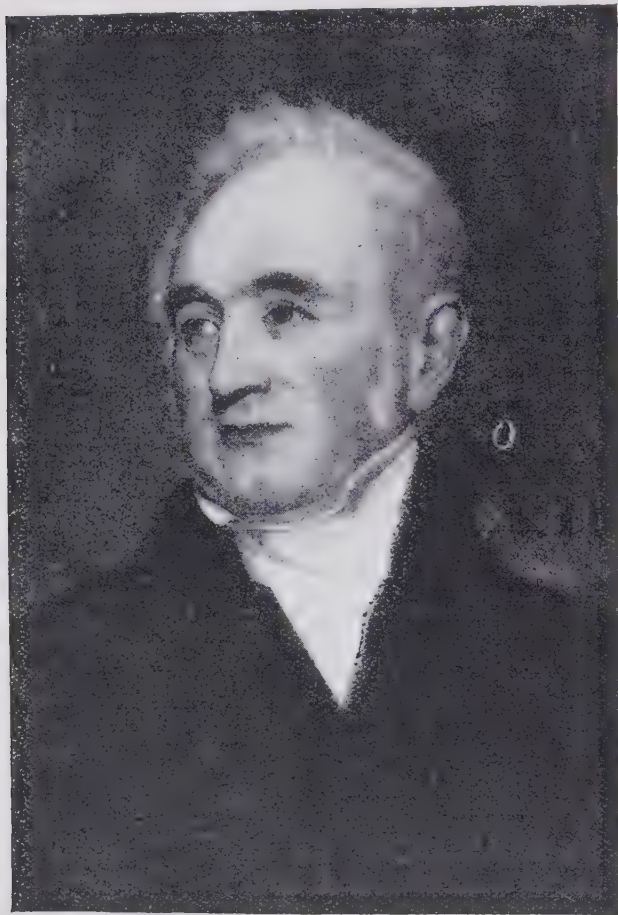
works, especially editions of the Greek classics, but was banished from Geneva for conspiracy (1602). The last great printer of the family was Antoine (1592-1674), who became French king's printer in 1623. See Renouard's *Annales de l'Imprimerie des Estienne* (1843).

Stephens, ALEXANDER HAMILTON (1812-83), American statesman, born in Taliaferro co., Georgia; was admitted to the bar (1834), and was member of Congress (1843-59). He supported the annexation of Texas (1838), opposed the secession of Georgia (1860), but afterwards joined the secessionists, and was elected vice-president of the Confederate states (1861). He was again a member of Congress (1873-82), and became governor of Georgia (1882). He wrote *A Constitutional View of the War between the States* (1868-70).

Stephens, GEORGE (1813-95), English archaeologist, was born in Liverpool. Philology early engrossed his interest, and in his dialectical researches he formed the theory that English was a Scandinavian, not a Germanic, language. In 1834 he took up his residence in Stockholm, where he taught English, and in 1851 he became lector, and later professor, of English in the university at Copenhagen. His most important work is *The Old Northern Runic Monuments of Scandinavia and England* (3 vols. 1866-84). He was much more successful and trustworthy as a collector than as an interpreter of such inscriptions.

Stephens, JAMES (1824-1901), Fenian 'head centre,' born at Kilkenny, where he was brought up as an engineer. He acted as Smith O'Brien's lieutenant (1848), and started the Fenian organization (1853). In 1864 he was seized and lodged in Richmond prison, from which he escaped to America, where he was deposed by the Fenians. He organized (1867) the attempt to seize Chester Castle, the rescue of Fenian prisoners in Manchester, and the Clerkenwell explosion.

Stephens, WILLIAM RICHARD WOOD (1839-1902), dean of Winchester (1894). In 1875 he was made prebendary of Chichester Cathedral, and was proctor in Convocation (1880-6). He published *Memorials of the... Cathedral Church of Chichester* (1876), *Life and Times of St. John Chrysostom* (1872), *Life and Letters of W. F. Hook* (1878), *Hildebrand and his Times* (1888), *Life and Letters of E. A. Freeman* (1895), and vol. i. of *History of the English Church* (1901); also biographies of *Baron Hatherley* (1883), *Dr. Freeman* (1895), and *Dr. Durnford* (1899).



George Stephenson. From the portrait by H. W. Pickersgill, R.A., in National Portrait Gallery.

gary (1000). During his reign Christianity was firmly established in his dominion.

Stephen Bathori. See BATHORI.

Stephens, called also ESTIENNE and ETIENNE, a family of French printers and publishers, the founder being Henri (c. 1460-1520), who set up (1501) his press close to the University of Paris, and printed about 120 works, the first being the *Ethics* of Aris-

tole in 8 vols. (1539-44), a Latin Bible in folio (1528), and a *Concordance* (1555). His son Henri (1528-98) was a printer in Paris and Geneva, devoting his fortune to the purchase of Greek manuscripts in order to restore the texts. Among his publications were *Anacreon* (1554), *Dictionnaire du Médecin* (1564), and *Thesaurus Græcæ Linguae* (1572). His son Paul (1566-1627) completed his father's unfinished

Stephenson, GEORGE (1781-1848), the inventor of the locomotive, was born at Wylam, near Newcastle. In 1812 he became engine-wright at Killingworth colliery, and there in 1814 ran the first locomotive, which he subsequently greatly improved by the 'steam-blast.' The invention of a colliery safety-lamp brought him fame (1815) and a public testimonial of £1,000. In 1821 he was appointed engineer for the construction of the Stockton and Darlington Ry. When the project of a railway between Liverpool and Manchester took form, Stephenson was appointed engineer, and triumphed over great obstacles to the completion of the line in 1829; and in the battle of the locomotives his 'Rocket' was easily victor, developing a speed of thirty-two miles an hour. See Smiles's *Lives of the Engineers* (new ed. 1904) and his *Life of George Stephenson* (5th ed. 1858).

Stephenson, ROBERT (1803-59), English engineer, the only son of George Stephenson, was born at Willington Quay, near Newcastle. After assisting his father in the surveys of the Stockton and Darlington Ry. (1821), he was appointed manager of his father's locomotive works at Newcastle. In 1833 he became sole engineer of the London and Birmingham line (completed 1838), the first railway into London. He was thenceforth engaged in railway work all over the world; and his bridges at Newcastle, at Montreal (1859), and over the Menai Strait (1854) ranked almost as modern wonders of the world. See Smiles's *Lives of the Engineers* (new ed. 1904), and Jeafferson's *Life of R. Stephenson* (1864).

Stepney. See LONDON.

Stepniak, SERGIUS (1852-95), the name by which Serge Michaelovitch Kravchinsky, Russian journalist and author, was known in England, was born at Hadjatch in the province of Chernigov. He became engaged in a secret propaganda among the peasants, and joined the chief revolutionary organization. In 1880 he was compelled to flee. He then devoted himself to writing and to lecturing both in England and America. He was a prominent worker for the English Society of Friends of Russian Freedom, founded in 1890 by Dr. Spence Watson, and for many years president of the Russian Free Press Fund, formed to supply the subjects of the Czar with literature forbidden within the boundaries of Russia. His works included *Underground Russia* (1882); *Russia under the Tsars* (1885); *The Russian Storm Cloud* (1886); *The Russian Peasantry* (1888); *Career of a Nihilist*, a

novel (1889); *Nihilism as it is* (1894); *King Stork and King Log—A Study of Modern Russia* (1895); and *Tyrannicide in Russia*. He was killed on the railway at Chiswick.

Steppes, a vast territory of European Russia, situated in the southern provinces of Astrakhan, Don Cossacks Territory, Ekaterinoslav, Kherson, Orenburg, and Taurida. It includes the region of flat, grass-clad plain lying south of the agricultural zone, and suitable for pastoral life.



Robert Stephenson.

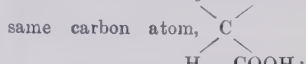
Stercorarius, a genus of skuas, including three or four species. Of these the pomatorhine skua (*S. pomatorhinus*) and the long-tailed skua (*S. parasiticus*) are visitors to Britain, while the Arctic skua (*S. crepidatus*), with its variety Richardson's skua, nests in Scotland.

Sterculiacæ, a natural order of tropical trees, shrubs, and herbaceous plants. Among the genera are Cola, Sterculia, Theobroma, and Buettneria.

Stere, the unit of cubic measurement in the metrical system, otherwise called the kilolitre. Its value in English measurement is 35'316 cub. ft. It is equivalent to a cubic metre.

Stereo-Chemistry, the science dealing with the spacial relations of the atoms in the molecule. It was originated independently by Le Bel and Van't Hoff in 1874 to explain the existence of certain isomeric compounds, the differences between which could not be expressed by formulae written on a plane, and it has been almost exclusively worked out for compounds of carbon. In their case it is assumed that the 'affinities,' or points at which

other atoms can be attached, are situated at the angles of a regular tetrahedron. It then follows that, if a different atom or group is attached at each of these points, two different compounds can be represented according to the order in which the groups are arranged, one arrangement being the mirror image of the other. Thus, from the chemical behaviour of lactic acid, four different groups—viz. H, CH₃, OH, and COOH—are united to the

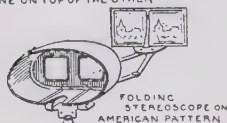
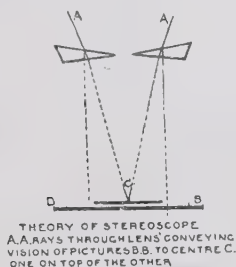


and it is found that two varieties of this compound exist, one of which rotates polarized light to the left, and the other to the right. Similar results are obtained with all other compounds in which the carbon atom is *asymmetric*, or attached to four different groups; whilst with those that contain two such atoms, such as tartaric acid, three varieties are possible, and are found to exist—viz. a dextro-rotatory variety, in which both sets of groups tend to twist polarized light to the right; a levo-form, which rotates to the left; and an inactive or meso-form, in which the rotation to the right, set up by one asymmetric atom, is neutralized by that of the other to the left. In a similar manner the differences between certain unsaturated compounds, such as fumaric and maleic acids, can be explained. See Van't Hoff's *Chemistry in Space* (trans. Marsh, 1891).

Stereo-Comparator, an instrument for examining celestial photographs, brought into use by Dr. Max Wolf in 1901. Two plates of the same sky region, but taken at different epochs, are viewed, as in a stereoscope, with the left and the right eye respectively. If the objects depicted have in the interim undergone change of any kind, the binocular combination of their images is disturbed, and a slight physical shock betrays the discrepancy. A large number of variables and asteroids have thus been detected by their fading or displacements between the dates of comparison.

Stereoscope, a binocular instrument constructed to view stereoscopic pictures produced by photography. Each eye sees a separate image or slightly different picture of the object, which, when viewed through the two half-lenses of a stereoscope, are blended into one, and, apart altogether from perspective or light and shade, stand out in bold relief, and the appearance of distance or other background is thrown back as in reality. Wheatstone invented the first

form of stereoscope in 1838. This was improved upon (1843-44) by Sir David Brewster, who discarded the mirrors of the former investigator, and having cut a double convex lens in two used the two half-lenses, which he placed with their thin outward edges facing inwards to the centre, thus forming sides of a concave lens. The whole he placed in a box, with reflecting hood and transparent back. The principle still remains, but the outward form has been greatly modified in the stereoscope brought out in America by Oliver Wendell Holmes. A Frenchman (Duboscq) took up (1849) Brewster's invention, and pursued it as a new branch of photography.



Stereoscope.

In stereoscopic photography the two lenses of the camera are placed in similar position and at nearly the same angle of convergence as that of the eyes. In printing stereo views from the glass negative, the prints must be cut separate and transposed, the right hand one to the left, and the left to the right, owing to the fact that the image is inverted by the lens in the camera. Stereo transparencies when viewed with transmitted light are superior to prints on paper viewed with light reflected. Stereoscopic projection by the analyticon or optical lantern arrangement, necessitating the use of polarizers by each person looking at the screen, has not proved of great advantage; but in the photographic work of the microscope, of X rays, and in astrophotography, the insect, the human frame, or the constellation of stars is made to stand out as in nature.

Stereotyping. See PRINTING.

Sterility, or want of reproductive power, may be total or partial. Darwin found that in

many plants and animals very slight changes in the environment produce sterility. Large numbers of cultivated plants rarely or never seed, and numerous captive animals do not breed, even if kept in an almost free condition in their native country. On the other hand, the domestic animals are often more prolific than those in a state of nature. Hybridism leads to sterility, either absolute or limited, and close interbreeding seems to impair the vigour and fertility of the offspring, so that in successive generations an advancing degree of sterility is produced. In the human female sterility may be due to conditions of age, as the reproductive period lies between puberty and the menopause; or it may depend upon disturbance of nutrition, such as results from wasting and other diseases, while temperature and climate also influence the reproductive functions. Absence, defective development, malformation, displacement, or disease of any one of the organs may be the cause of sterility, as may also tumours or disease of neighbouring parts. Cases due to absence or to imperfect development of important organs are hopeless, as also are many of those which result from morbid changes in the pelvic organs. But childlessness does not necessarily imply sterility. A woman may be childless by her first husband and bear children to her second. A male may be sterile independently of impotence.

Sterling, a word applied to the 'legal tender' of the United Kingdom. It is derived from the Easterlings or Hanse merchants.

Sterling, tn., Whiteside co., Illinois, U.S.A., on Rock R., 109 m. w. of Chicago; manufactures agricultural implements, paper, and flour. Pop. (1900) 6,309.

Sterling, ANTOINETTE (MRS. MACKINLAY) (1850-1904), American contralto vocalist, born at Sterlingville, U.S.A.; studied under Madame Marchesi, Madame Viardot, and Manuel Garcia. She first visited Britain in 1868, and made her permanent residence there in 1873. She had a voice of rare richness and volume, sang with much expression, and had an equally great reputation as a singer in oratorio and as a ballad vocalist. See *Life* by her son (1906).

Sterling, JOHN (1803-44), Scottish author, was born at Kames Castle in the island of Bute. Taking to journalism, he became one of the mainstays of the *Athenaeum* in its early days. His life was one long struggle and search after health. He spent most of his winters abroad, and wrote much for *Blackwood*, and the *Westminster*. He owes his

reputation to his genius for friendship, and to Carlyle, whom he met in 1835. See Carlyle's *Biography* (1851), and Julius Hare's edition of Sterling's *Essays and Tales* (1848).

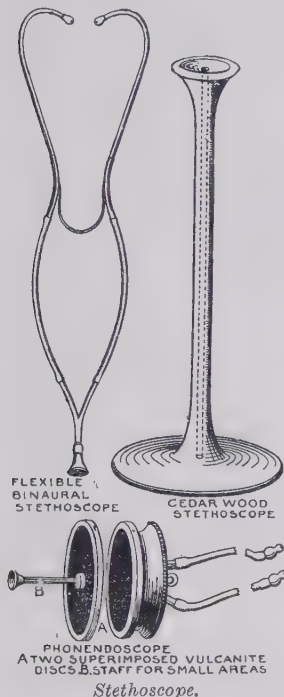
Sterlitamak, tn. and river port, Ufa gov., E. Russia, 73 m. s. of Ufa town; with tanneries, brick works, and manufactures of leather, soap, and fur garments. Pop. (1897) 15,538.

Stern, DANIEL. See AGOULT.
Sternberg, tn., Austria, 9 m. by rail N. of Olmütz; centre of the cotton and linen industries of Moravia. Pop. (1900) 15,195.

Sterne, LAURENCE (1713-68), Irish novelist and humorist, born at Clonmel. Having entered holy orders, he obtained the living of Sutton, near York, to which was afterwards added that of Stillington and a prebendary's stall at York Minster. The first two volumes of *The Life and Opinions of Tristram Shandy* appeared in 1760, and at once leaped into popularity. The *Sermons by Yorick* still further enhanced Sterne's reputation, as they contain some of the most pithy *morceaux* of popular divinity in the language. He was the idol of London society during a visit he paid to the capital in March 1760, and was presented to the living of Coxwold (1760). Vols. iii. and iv. of *Tristram Shandy* appeared in December of the same year, followed by vols. v. and vi. in 1762, and by the seventh and eighth volumes in 1765, along with two more volumes of *Sermons*. The ninth volume concluded this great novel, which contains some of the most piquant and incisive character studies in our language. Sterne then visited Italy, and obtained materials for what he intended to be another long work, *A Sentimental Journey through France and Italy* (1768). Sterne is one of the greatest of English humorists, the true secret of his power being the subtle blending of laughter and pathos. In some things he resembles Rabelais; in others he anticipated Jean Paul (Richter). The standard edition of his *Works* is that of 1780, in 10 vols. (new ed. 1903). See *Life* by Percy Fitzgerald (new ed. 1905); H. D. Traill's *Sterne*, in *English Men of Letters* (1878); and John Ferriar's *Illustrations of Sterne* (1878).

Sternhold, THOMAS (d. 1549), joint versifier of the Psalms with John Hopkins (d. 1570), was born at Southampton. In 1538 he appears as one of Cromwell's friends and dependants. In his version he adopted the simple ballad metre, now known as common metre. Early editions of the Psalms were published in 1549, 1551, and 1562 (complete). See *The Scottish Psalter* by Neil Livingston (1864).

Stesichorus (c. 630-550 B.C.) of Himera in Sicily, lyric poet of ancient Greece. Legend told that he was struck blind for writing an attack on Helen. His works were lyrical romances, and aided the development of tragedy from choric songs. His dialect was Dorian. Only fragments are extant, for which see Bergk's *Poetae Lyrici Graeci* (ed. 1900).



Stethoscope, a medical instrument for conveying to the physician's ear the sounds within a patient's chest wall. Immediate auscultation was described by Hippocrates; but it occurred to Laennec that the respiratory and other sounds might be carried by an instrument interposed between the patient and the listener. He experimented first with a roll of paper, and later introduced a hollow wooden cylinder with a bell-shaped chest piece and a flattened disc for the ear. This, greatly modified, is the form now in use. For the auscultation of children a flexible tube is often more useful. Of late years double stethoscopes have been in vogue. A more modern modification is the phonendoscope, in which the sound is conveyed through a solid rod to a vulcanite resonator, whose vibrations are transmitted through flexible tubes to the ears; but it does not convey high-pitched sounds so well as low.

(8)

Stettin, tn., cap. of prov. Pomerania, Prussia, on Oder, 30 m. from Baltic. It has churches of the 12th and 14th centuries, and a royal palace (1575). In 1898 a free port was opened on the E. bk. of the Oder. Manufactures are cement, clothing, machinery, sugar, chemicals, porcelain, and paper. Stettin is one of the most important German shipbuilding centres. Pop. (1900) 210,702.

Steuben, FREDERICK WILLIAM, BARON (1730-94), general in the war of the American revolution, born at Magdeburg in Germany, distinguished himself in the Seven Years' war. He offered his services to Washington (1778), was made major-general, and took an active part in the battle of Monmouth and the siege of Yorktown. He was a member of the court-martial on Major André (1780). See Kapp's *Life of Steuben* (1859).

Steubenville, city, Ohio, U.S.A., co. seat of Jefferson co., 22 m. N. of Wheeling, and on the Ohio, with iron and glass industries, coal, and natural gas. Pop. (1900) 14,349.

Stevadore, one who takes charge of the loading and unloading of cargoes. A master is supposed to be a competent stevedore, and is responsible for bad stowage. But a professional stevedore is generally appointed, and shipowners are responsible for stowage, unless (1) the shipper assented to the method of stowage, (2) the shipper alone was aware of special risks from the nature of the cargo, or (3) the shipper employed his own stevedore and the master did not interfere.

Stevenage, tn., Herts, England, 4 m. S.E. of Hitchin, on Great North Road. The church of St. Nicholas is ancient. Straw-plaiting is a local industry. In the vicinity are large tumuli. Pop. (1901) 3,958.

Stevens, ALFRED (1818-75), English artist and designer, was born at Blandford in Dorset. Going to Italy in 1833, he acted as assistant to Thorwaldsen in Rome (1841). On his return to England in 1842 he became a teacher of design in London (1845), and designer for various establishments. His *Wellington Monument* in St. Paul's, unfinished at his death, ranks Stevens with the foremost of modern sculptors. See Stannus's *A. Stevens and his Work* (1891), and Armstrong's *Alfred Stevens* (1881).

Stevens, HENRY (1819-86), American bookseller and bibliographer, born at Stevensville, Barnet, Vermont; came to London (1845), and was employed in addition to the collection of American books in the British Museum and enriching American libraries. He wrote *Historical Nuggets*

(1858), *Historical Collections* (1881-6), and *Recollections of James Lenox* (1886).

Stevenson, ADLAI EWING (1835), vice-president of the United States (1893-7), was born in Christian co., Kentucky. Admitted to the bar (1857), he was master of chancery (1860-4), member for Congress (1875-7), assistant postmaster-general (1885-9). In 1897 he was a member of the commission to Europe to secure international bimetalism.

Stevenson, ROBERT (1772-1850), Scottish civil engineer, was born at Glasgow, and succeeded his stepfather as inspector of lighthouses in 1796. He constructed no fewer than twenty lighthouses, of which the Bell Rock was the most remarkable. He made also many improvements in the system of lighting, bringing the catoptric or reflecting system to perfection, advocating the adoption of the dioptric or refracting system, and inventing the intermittent and flashing lights. In 1814 he was accompanied in one of his voyages of inspection by Sir Walter Scott.

Stevenson, ROBERT LOUIS BALFOUR (1850-94), Scottish novelist and poet, only son of Thomas Stevenson, was born in Edinburgh. On the mother's side he was a cadet of the Balfours of Pilrig; hence the name of his hero, David Balfour, in *Kidnapped* and *Catriona*. His remote paternal ancestors were farmers in the Covenanting west; his nearer forefathers were eminent engineers and builders of lighthouses. In 1866, the Covenantan coming out in him, he wrote *The Pentland Rising*; and in 1871 he edited and contributed to an *Edinburgh University Magazine*. In 1873 he met his lifelong friend, Mr. Sidney Colvin, and so came into touch with literary society. In the same year he was at Mentone, and wrote the essay *Ordered South*; which proved his eminent gifts in literature. For some seven years at least he had been studying and practising the art of expression, imitating now one famous style, now another, so that, at the age of twenty-three, his own manner was the dainty, vivacious, energetic manner which we know—a thing alive to the finger-tips, full of unexpected and delightful turns and cadences. Meanwhile (1876-9) Stevenson produced a charming series of essays and short stories in the *Cornhill Magazine* and elsewhere, and chronicled two sentimental journeys in *An Inland Voyage* and *Through the Cévennes with a Donkey*. During a holiday in the forest of Fontainebleau he met an American lady, followed her to America, married her, and

returned to Europe (1880). Partly to amuse his stepson, he began *Treasure Island* (1882), which was a great success. This was followed by *The Black Arrow* (1888, dearer to boys than to men), and by *Kidnapped* (1886), *Catriona* (1893, a sequel), and *The Master of Ballantrae* (1889), all historical romances of adventure.

By this time Stevenson had proved his mastery in many fields, one of which he invented. This was shown in the brilliant fan-

vivals of his imaginative infancy. Apart from all these varieties was the gruesome allegory *Dr. Jekyll and Mr. Hyde* (1886), revealed to him in a dream. Despite these and other pieces Stevenson remained poor, for at first he was not 'popular.' The public is irritated by a style like his. And again, 'he was not always wholly serious.' He had too much of irony and of humour to reach the vast reading public. Moreover, he was a man of an open hand,

was in all ways overworked. Vailima was his Abbotsford or Monte Cristo: he kept open house and open purse. With Mr. Osbourne, his stepson, he wrote *The Ebb Tide* (1894), a gloomy thing; the amusing but perplexing and ill-constructed *Wrecker* (1892); and all but the last chapters of *St. Ives*, published with a finish by Mr. Quiller-Couch (1897). Lastly he settled on *Weir of Hermiston* (1896), in which he found his powers more mature and vigorous than ever. He died suddenly, stricken down on a day of great heat.

Stevenson as a man is all revealed in his books: they are full of his invincible and blithe stoicism, his courage, his high intellectual spirits, his boundless charity, his combination of the wisdom of the sage with the hallucinatory fancy of the child and the chivalrous loyalty and adventurous heart of the boy. They who would know him more familiarly, if possible, must read his *Letters to his Family and Friends*, edited (1894-9) by Mr. Sidney Colvin. Stevenson's 'appeal' is to the very same passions and emotions as those which moved the audience of Homer. His heart is with man as a being that toils, loves, and fights in the open air—the hunter, the sailor, the warrior. To place his work beside Scott's is the act of 'a devout imagination.' He has not Scott's limitless power of dramatic creation, any more than Scott had or tried to cultivate Stevenson's matchless verbal felicity. Neither novelist dealt much with the passion of love. Only in *Weir of Hermiston* does Stevenson really give his strength to varied studies of this master passion, succeeding in an almost unexampled degree. He certainly could draw women—Barbara Grant, the two Kirsties, and *Catriona* herself; but he as certainly was more at home with men. He once matched himself against Scott in a story of the supernatural: 'Thrawn Janet' is his 'Wandering Willie's Tale.' The atmosphere of terror is wonderfully produced; the manner of telling is beyond all praise. But where is the humour which inspires Wandering Willie? and where is the poetry, as in that vision of Claverhouse—beautiful, scornful, remote, lonely as in life among the brawling and drinking lost souls of the persecutors of the saints? Somehow, somewhere, there was in the genius of Stevenson a gloomy spot. Sir Walter would not have dwelt with the horrors of the house of Ballantrae, or in the moral squalor of *The Ebb Tide*. But even in *The Master of Ballantrae* Stevenson presents the Chevalier Bourke, an Irishman not borrowed from



Robert Louis Stevenson.

(Photo by H. Walter Barnett.)

tasies of Oriental adventure in modern life. *The New Arabian Nights* (1882). *Prince Otto* (1885) was a highly-elaborated romance of a fancied German princely court. Nothing cost the author so much pains: it is full of passages of surprising beauty, but it is the most *prétexteux* of his writings. His essays continued to surpass all that have been written since Lamb's time or Thackeray's, and his *Child's Garden of Verses* (1885) is full of delightful sur-

and though simple in his tastes, he knew no limit in his gifts. When he went to New York, and thence on a voyage in the southern Pacific (1887-90), he had still to be writing hard for a livelihood; when unable to speak or to hold the pen, he dictated fiction on his fingers by the dumb alphabet. In Samoa, where he built a house (Vailima) and settled, he was known as Tusi-tala ('the Tale-teller'). There he recovered his health (1890-4); but he

Barry Lyndon, and well worthy to associate with that great rogue, while redeemed by humour and a doglike loyalty. The best edition of his *Works* is the Edinburgh edition (1894-8). See *Lives* by Baildon (1901), Balfour (1901), and Japp (1902).

Stevenson, THOMAS (1818-87), Scottish engineer and meteorologist, was born in Edinburgh, the youngest son of Robert Stevenson. His first scientific paper (1842) was in connection with meteorology, for the advance of which he and the instruments he invented were largely responsible. He constructed his first lighthouse in 1843, and was in 1853, with his brother, appointed engineer to the Board of Northern Lighthouses. His chief work was in the improvement of the means of lighthouse illumination, and in 1859 he published *Lighthouse Illumination*, which in the second edition (1871) became *Lighthouse Construction and Illumination*. See R. L. Stevenson's *Memories and Portraits* (1887).

Stevens Point, cap. of Portage co., Wisconsin, U.S.A., on l. bk. of Wisconsin, 150 m. N.W. of Milwaukee; with sawmills and furniture factories. It trades in artificial flies for anglers. Pop. (1900) 9,520.

Stevenson, tn. and par., Ayrshire, Scotland, near Firth of Clyde, 28 m. S.W. of Glasgow; with coal mines, iron works, Nobel's explosives factory, and foundries. Pop. (1901) of tn. 6,554.

Steward, of a manor. See MANOR.

Steward, LORD HIGH. See LORD HIGH STEWARD.

Steward of the Household, LORD, is the chief officer of the Board of Green Cloth, which regulates the accounts and expenses of the royal household and the good government of the sovereign's servants. The lord steward was also the chief judge of the Court of the Marshalsea. This court, the civil jurisdiction of which was abolished by 12 and 13 Vict. c. 101, had civil and criminal jurisdiction within the verge—i.e. a circuit of twelve miles round the actual residence of the sovereign. By the Coroners Act, 1887 (50 and 51 Vict. c. 71, s. 29), the jurisdiction of the lord steward is restricted to offences committed within the limits of any of the royal palaces or of any house where the sovereign is then demurant.

Stewart, STEUART, or STUART, a Scottish family who trace their descent from a Norman baron, Flaald, whose grandson Walter (d. 1177) was appointed steward of David I. From sons of Sir John (killed at Falkirk in 1298), nephew of Walter (d. 1246), were descended the Stewarts, Earls

of Angus; the Stewarts or Stuarths, Earls and Dukes of Lennox; the Stewarts, Earls of Galloway; the Stewarts of Lorn and Innermeath, and the Stewarts of Allanton, Coltness, and Grandtully. The Stewarts of Lorn and Innermeath were ancestors of the Earls of Atholl, and the later Earls of Buchan are an offshoot of the same branch, though they have also ties of relationship with the direct royal line. From a natural son of James, first Earl of Buchan, were descended the Earls of Traquair. The first Stewart of the royal line of Great Britain was Robert, son of Walter, sixth high steward, by Marjory, daughter of Robert the Bruce, who succeeded in 1371 to the Scottish throne as Robert II. From a natural son of Robert II. are descended the Stewarts of Dalguise, Perthshire, and the Stewarts, Marquises of Bute; and a natural son of Robert III. is paternal ancestor of the Shaw Stewarts of Blackhall and Greenock, Renfrewshire. From natural sons of the fourth son of Robert II. (Alexander, known as the 'Wolf of Badenoch') are descended the Stewarts of Atholl, who, with the Stewarts of Appin, descended from a natural son of the last Lord Lorn, are regarded as constituting the Highland clan of the Stewarts.

The direct legitimate male line of the elder branch of the royal Stewarts terminated with the death of James V. His daughter Mary, who succeeded him on the Scottish throne, claimed that of England against Elizabeth, on account of descent from Margaret Tudor, queen of James IV.; and Mary's son, James VI., in ascending the English throne, became the progenitor of the royal line of Great Britain. By his father, Lord Darnley, son of the Earl of Lennox, James VI. was also descended from a branch of the Stewart line, which claimed against the Hamiltons, Earls of Arran (descended from the Princess Mary, daughter of James II.) to be next heirs after James himself to the Scottish throne, on account of an asserted illegitimate link in the Hamilton descent. After the flight of James VII. of Scotland and II. of England to France in December 1688, the elder male line descended from James VI. and I. was permanently debarred from the throne, William of Orange (son of Mary, eldest daughter of Charles I.) and his wife Mary (eldest daughter of James VII. and II.) succeeding in 1689. On the death of William (1702), Anne, younger daughter of James VII. and II., was called to the throne of Scotland and England without opposition. On her death

(1714) she was succeeded by George, son of Sophia, daughter of Elizabeth, daughter of James VI. and I., and wife of Frederick V., Count Palatine of the Rhine. The last male representative of the senior Stewart royal line, descended from James VI. and I., was Henry, Cardinal York, younger brother of Charles Edward, the 'young Chevalier,' and son of James, incorrectly termed the 'Pretender;' and with the death of Henry terminated also the male line of the original Earls of Lennox, descended from Sir John Stewart of Demeley. But for the Act of Settlement of 1701, the heirs to the throne after the death of Cardinal York would have been the Sardinian line, descended from Henrietta Maria, youngest daughter of Charles I. and Philip, Duke of Orleans, son of King Louis XIII. of France, and now represented by Rupert, son of Prince Louis of Bavaria and Maria Theresa, archduchess of Austria. See histories of the Stewarts, by Crauford (1710), Duncan Stewart (1739), and A. Stewart (1793-9); Stewart's *Stewarts of Appin* (1880), P. M. Thornton's *Stuart Dynasty* (1891), Skelton's *The Royal House of Stuart* (1890), and J. J. Foster's *The Stuarts . . . in Art* (1903).

Stewart, ALEXANDER (1829-1901), Scottish author and naturalist, known under his pen-name of 'Nether Lochaber,' was born in Benbecula. For some time he was minister of the Gaelic Church, Paisley, from which he afterwards removed to Ballachulish and Ardgour, where he officiated for fifty years. His works include *Nether Lochaber* (1883) and *'Twaix Ben Nevis and Glencoe* (1885).

Stewart, ALEXANDER TURNER (1803-76), American millionaire and philanthropist, born at Lisburn, Ireland, opened a store in New York (1825), which became the most extensive dry-goods business in the world. He was noted for his acts of charity. After his burial his corpse was abstracted by robbers, but was recovered. See Chambers's *Stories of Remarkable Persons* (1878).

Stewart, BALFOUR (1828-87), Scottish physicist and meteorologist, was born in Edinburgh. He became director of the Kew observatory in 1859, and in 1870 professor of physics at Owens College, Manchester. His first important work was on 'Radiant Heat' in *Trans. Royal Soc. Edin.* (1858), and from 1859 he devoted himself particularly to meteorology, especially to the phenomena of terrestrial magnetism. He was also one of the workers towards the discovery of spectrum analysis. He published

successful text-books on *Heat and General Physics*, but his two best works were the *Conservation of Energy* (1872), and, in collaboration with Professor Tait, *The Unseen Universe* (1875).

Stewart, DAVID. See ROTHE-SAY, DUKE OF.

Stewart, SIR DONALD MAR-TIN (1824-1900), British field-marshal, was born near Forres, and entered the Bengal army (1840). He took part in the sieges of Delhi and Lucknow and in the Rohilkhand campaign, and commanded the Bengal brigade in the Abyssinian war (1867-8), and the Kandahar column in the Afghan campaign (1878), subsequently effecting his famous march from Kandahar to Kabul (1880). He was commander-in-chief in India (1880-5), and was created a field-marshal in 1894. See *Life by Elsmie* (1903).

Stewart, DUGALD (1753-1828), Scottish philosopher, was born at Edinburgh. For a time (1772-85) he acted as colleague to his father, the professor of mathematics at Edinburgh, but in 1785 was transferred to the more congenial chair of moral philosophy, which he held till 1820. As a lecturer he made for himself a brilliant reputation, and by his writings did much to popularize and diffuse the philosophy which he had learned from Reid at Glasgow. But he was not himself an original thinker, and his best work was done in the field of psychological observation. His chief writings are *Elements of the Philosophy of the Human Mind* (3 vols. 1792-1827); *Outlines of Moral Philosophy* (1793); *Philosophical Essays* (1810); *The Philosophy of the Active and Moral Powers* (2 vols. 1828). There is a collected edition of his *Works* by Sir William Hamilton (1854-8).

Stewart, SIR HERBERT (1843-85), British general, was born in Hampshire, and after service in India served on Wolseley's staff in the Zulu war. He took part in the Boer war, and shared in the disaster at Majuba Hill. Then he served in the Egyptian campaign against Arabi Pasha, and in 1884 commanded the desert column for Khartum, and fought the engagement at Abu Klea, but was mortally wounded at Metamamah.

Stewart, JAMES (1831-1905), Scottish missionary, born at Edinburgh. He joined Livingstone's Zambesi expedition (1862); founded the Blythwood mission institute in the Transkei, and the Kibwezi mission in memory of Sir William Mackinnon. His life-work, however, was the building up of the missionary college of Lovedale, of which he was the principal and superintendent from 1870 till his death. He was

appointed moderator of the Free (now the United Free) Church in 1899, and Duff Lecturer in 1902. He wrote *Lovedale* (1894), *Dawn in the Dark Continent* (1903), and the *Duff Lectures for 1902* (1903); he also compiled a grammar, dictionary, and phrase book of the Kaffir language.

Stewart, SIR JOHN. See LENNOX.

Stewart, MATTHEW (1717-85), Scottish mathematician, was born at Rothsay. In 1746 he published *General Theorems in Use in the Higher Parts of Mathematics*. Though ordained as minister of Rosneath (1745), he was appointed professor of mathematics at Edinburgh University, and resigned his charge in 1747. His mathematical work was remarkable for the use of elementary geometrical principles only. He published *Tracts... in Physical Astronomy* (1761).

Stewart, PATRICK (1832-65), British soldier, was born at Cairnmore, Kirkcudbrightshire; became attached to headquarters staff during the relief of Lucknow; was on the staff of Lord Canning (1858); in 1863 was appointed director-general of the government Indo-European telegraphs at Bombay; and superintended the laying of the cable from Gwadar to Fao.

Stewart, ROBERT. See CASTLEREAGH.

Stewart, SIR THOMAS GRAINGER (1837-1900), Scottish physician, was born in Edinburgh. He became pathologist to the Edinburgh Royal Infirmary (1862), and was appointed professor of the practice of physic in the university (1876), and physician to Queen Victoria (1882). His *Practical Treatise on Bright's Disease* (1869) is still the leading authority on the subject. He was knighted in 1894.

Stewart Island, New Zealand, separated from South Island by Foveaux Strait, has an area of 665 sq. m., is mountainous (3,200 ft.) and forest-clad, and a tourist resort in summer; has two good harbours, and oyster-fishing. Pop. (1901) 272.

Stewarton, tn., Ayrshire, Scotland, 5 m. N. of Kilmarnock, with dairy produce, carding and spinning industries, and manufactures of Scotch 'bonnets,' forage caps, and bee boxes for apiarists. Pop. (1901) 2,858.

Stewartry, the designation of Scottish crown lands over which a deputy or steward had charge. There were several of these in Perthshire, Argyllshire, Lanarkshire, Galloway, and Wigtown; but only one retains its name—viz. the 'Stewartry of Kirkcudbright.' The title to-day is used in place of 'county.'

Stewing. See COOKERY.

Steyn, MARTINUS THEUNIS (1857), ex-president of the Orange Free State, was born at Winburg, Orange River Colony. He practised at the Bloemfontein bar from 1882 until 1889, when he was appointed state attorney, then second puisne judge. In 1893 he became first puisne judge, and this position he held till 1896, when he was elected president of the Orange Free State. On the outbreak of the Boer war (1899) he threw in his lot with the Transvaal. For more than a year he was pursued by the columns of the British army, on one occasion (July 13, 1901) being so nearly captured at Reitz by Broadwood's column that he is said to have escaped in his shirt only.

Steypning, tn., Sussex, England, 5 m. N.W. of Shoreham. It is a very ancient place, and was formerly on the coast. There are 11th and 12th century remains of a church belonging to a Benedictine priory. Two incised crosses are supposed to date from Saxon times. St. Andrew's church has some fine Norman arches. Pop. (1901) 1,752.

Steyr, tn., Upper Austria, at influx of Steyr into the Enns, 90 m. W.S.W. of Vienna. There are an old castle (10th century) and a Gothic church (1443). Steyr has iron industries. Pop. (1900) 27,773.

Sticking-plaster. See PLASTERS.



Stickleback.

1. *Gasterosteus pungitius*. 2. *G. spinulosus*. 3. *G. aculeatus*.

Stickleback (*Gasterosteus*), a genus of small bony fish, constituting a special family (the Gasterosteidae). The popular name is given on account of the presence of spines in front of the dorsal fin, while the scientific name refers to the large scutes arranged along the sides of the body, which take the place of scales. Apart from these two characters, the sticklebacks may be distinguished by the elongate compressed body, the oblique

mouth-cleft, and the reduction of the pelvic fins. The three species commonly found in fresh water in Britain are distinguished by the number of their spines, which are respectively three, four, or nine in number. The first (*G. aculeatus*) is the commonest, and frequently descends also to the sea, where it is found in brackish pools near high-water mark. The marine form (*G. spinachia*) has fifteen spines, and differs from the other forms in the great elongation of the slender body and of the snout. All the species of stickleback are voracious, devouring large quantities of the fry of other fish. They are also actively pugnacious, the males fighting fiercely with one another. Nest-building is practised both by the sea stickleback and by many of the fresh-water species. The nest is constructed by the male, and is made of weeds, woven together by a silken thread into a pear-shaped structure. The male then conducts a female to the nest and induces her to deposit her eggs in it, fertilizing these as they are laid. The female subsequently leaves the eggs to their fate; but the male watches over them with much care. The eggs hatch in from three weeks to a month.

Stieler, ADOLF (1775-1836), German cartographer, born and resident at Gotha, where he was employed (1797-1836) in the service of the government. He edited an *Atlas* (1817-23), which ran through a large number of editions (e.g. 1904-5), and compiled a huge map of Germany in twenty-five sheets. He wrote *Geographische Uebersicht der Sachsen-Ernestinischen, Schwarzburgischen, Reussischen und der anliegenden Lande* (1826).

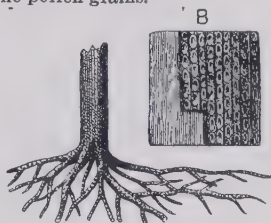
Stier, EWALD RUDOLF (1800-62), German theologian, born at Fraustadt in Posen. Commencing as a disciple of Richter, he gradually settled to an orthodox view of the gospel teaching. His works, which are esteemed for their homiletic value, include *Words of the Lord Jesus* (1843), in which he supports the doctrine of inspiration. His works are translated in Clark's Theological Library. See *Life* in German by his sons (1863).

Stiff-neck, a popular name for muscular torticollis or acute wry neck, due to muscular rheumatism of the cervical muscles. The condition is commonest in young subjects, and is apt to recur. In the treatment rest and warmth are essential. The neck should be covered with cotton wool and flannel bandages, and the arm of the affected side should be supported in a sling. Hot fomentations, belladonna plaster, and local applications of opium relieve the pain. Hot baths are

useful, and purgatives should be given, as well as alkaline mixtures, and sometimes quinine. To ward off a recurrence, warm flannel clothing should be worn next the skin, and cod-liver oil should be taken internally.

Stigand (d. 1072), archbishop of Canterbury, was several times appointed to and deposed from the bishopric of Elmham; but he seems to have obtained full possession in 1044, and in 1047 became bishop of Winchester. In 1052 he was appointed archbishop of Canterbury; but the pope refused to accept him. In 1058 he received, however, a pall from Benedict X.; but as this pope was declared uncanonical and was deposed, Stigand's position was only made worse, and in 1071, when the papal legates visited England at William's request, Stigand was condemned for usurpation of the see, for receiving his pall from a schismatic pope, and for holding on to the see of Winchester.

Stigma, that part of the pistil of a flower whose function it is to receive the pollen. The surface of the stigma is usually sticky from a secretion yielded by the cells which terminate it. In the case of wind-fertilized flowers the stigma is often covered with long hairs to collect the pollen grains.



Stigmara.

A, *Stigmara ficoides*; B, bark of *Sigillaria Davuruzii*.

Stigmara, rootlets of the fossil genera *Sigillaria* and *Lepidodendron* of the Carboniferous system. Some are from 30 to 40 ft. in length, while their width varies from two feet down to less than an inch. Some authorities are inclined to regard *Stigmara* as underground stems or rhizomes; but the majority consider that they are typical roots, comparable in some measure to the rhizophores of certain living *Selaginellas*, which are not very distinctly related to them. They were apparently adapted to a moist habitat, and to soils richly charged with humus.

Stigmatization, the marks of the wounds of Jesus Christ which have appeared upon the bodies of certain individuals. It may be doubted whether the words of St.

Paul are to be taken literally, 'I bear in my body the marks of the Lord Jesus' (Gal. 6:17), but this may have been so. St. Francis of Assisi, in 1224, saw a shining seraph, between whose glowing wings hung the Crucified, approach him from heaven. The agony of rapture left him with the sense that upon his own hands and feet were the mark of the nails. These marks were seen by many, including Pope Alexander IV. It is said that St. Catherine of Siena underwent a somewhat similar experience. St. Veronica Giuliani (canonized 1831) received the stigma of the crown of thorns, and afterwards those of the nails, about 1694. Anna Emmerich (1774-1824), at Dülmen in Westphalia, Maria von Mörl (1839), Louise Lateau (1866), Mrs. Gilling, 'mother' of the English Shakers (1864), and many others are said to have received the stigmata. Apart from the question whether such markings ought to be regarded, as in the Church of Rome, as a sign of God's peculiar favour, modern study of the possible effects of mental action upon the body precludes wholesale denial of the facts recorded.

Stilbite, a zeolite consisting of hydrated silicate of calcium and aluminium, usually forms divergent bundles of white prisms (sp. gr. 2.2, h. = 3½), with a fine pearly lustre on certain faces, and sometimes red in colour. It is found in cavities of the igneous rocks of the Kilpatrick and Campsie hills and Skye in Scotland, in the Faroe Is., and in Iceland. The red varieties are sometimes described as heulandite.

Stilicho, FLAVIUS (359-408), minister and general under the Roman emperors Theodosius and Honorius. He was of Vandal origin, and having risen to be master of the horse (384), he conducted an embassy to Persia; was made commander-in-chief of the army, and married to the emperor's niece Serena. Later Theodosius entrusted the education of his son Honorius to him and Serena, and in 394 appointed Stilicho governor at Rome. For several years Stilicho was engaged in war with Alaric, king of the Goths, whom he defeated in two great battles in 402 and 403. He then aimed at making himself master of the empire; in 405, however, he had to put down Radagaisus, who invaded Italy with a mixed horde of Germanic tribes. But his soldiers turning against him, he fled to Ravenna, where he was murdered.

Still. See DISTILLATION.

Still, JOHN (1543-1608), author of what, until the discovery of *Royster Doyster*, was considered the earliest English comedy, *Gammer Gurton's Needle* (1575).

Still was professor of divinity at Cambridge in 1570, and was master of St. John's College, and afterwards of Trinity College. In 1592 he became bishop of Bath and Wells.

Stillbirth and Stillborn. The term 'stillborn' may be applied to children who are born dead, or who do not breathe at birth. The most frequent causes of stillbirth are protraction of the labour or immaturity of the fœtus. If the child be suffering merely from apnoea, efforts should be directed towards the establishment of the respiratory function.

Stilling, JOHANN HEINRICH (1740-1817), called Jung Stilling, German Pietist, born at Grund in Hesse-Nassau, was studying medicine at Strassburg when he became acquainted with Goethe, on whose advice he wrote his autobiography, *Lebensgeschichte* (1777-1804; new ed. 1899). He practised as a physician at Elberfeld, and was appointed a professor at Kaiserslautern (1778), at Marburg (1787), and at Heidelberg (1804). He was a specialist in eye diseases, and a leader of the Pietists. A complete edition of his works was published in 12 vols. (1843-4).

Stillingfleet, EDWARD (1635-99), English prelate, was born at Cranborne in Dorsetshire, and appointed rector of Sutton in Bedfordshire (1657), where he wrote his *Irenicum*, a treatise on church government, which he regards as a matter left open by the apostles. Under the influence of Hobbes his theory was broadly latitudinarian, though he himself departed from it in later years. The Socinians and the Roman Catholics were the especial objects of his attacks. In 1662 appeared his *Origines Sacrae*, in 1664 his *Rational Account of the Grounds of the Protestant Religion*, in 1685 his *Origines Britannicae*, and in 1689 his *Ecclesiastical Cases*. He became rector of St. Andrew's, Holborn (1665); canon residentiary (1670) and dean (1678) of St. Paul's; and bishop of Worcester (1689). See Life by Godwin, prefixed to his *Collected Works* (1710).

Stillman, WILLIAM JAMES (1828-1901), American painter and journalist, born at Schenectady, New York state. In 1850 he came to England, where he met Ruskin; and then offered his services to Kossuth, who employed him to go to Hungary to dig up the buried crown jewels. This he tried, but without success. After his return to America he took to landscape-painting. He joined the literary coterie at Cambridge, Massachusetts, then crossed to London, went with Ruskin to

Switzerland, and was appointed United States consul at Rome (1861) and in Crete (1865), but resigned, and settled at Athens (1868). When Herzegovina rose in insurrection (1875) Stillman became correspondent for the *Times*, and for many years after acted as its correspondent in Athens and Rome. His works include *The Acropolis of Athens* (1870), *The Cretan Insurrection* (1874), *Herzegovina and the late Uprising* (1877), *Turkish Rule and Turkish Warfare* (1877), *On the Track of Ulysses* (1888), *The Old Rome and the New* (1897), and *Francesco Crispi* (1899). See his *Autobiography of a Journalist* (1901).

Stillwater, city, Minnesota, U.S.A., co. seat of Washington co., on St. Croix R., 16 m. N.E. of St. Paul; has lumber mills and agricultural implement works. Pop. (1900) 12,318.



Stilt.

Stilt (*Himantopus*), a genus of extremely long-legged wading birds related to the avocets. The first toe is absent, and the other three are only slightly webbed. The bill is elongated, and is slightly curved up at the tip, while the slitlike nostrils are placed at its base. The six or seven species have all some black in their plumage, this being usually set off by a white under surface. The birds haunt marshes. The black-winged stilt (*H. candidus*) has been obtained in Britain, and is greenish-black above, the head, neck, lower part of the back, and under surface being white. This bird breeds in southern Europe, in Africa, and in India, and visits the northern parts of Europe.

Stilton, vil., Huntingdonshire, England, 4 m. N.W. of Holme station (G.N.R.), and on Ermyng Street. It gives name to an excellent kind of cheese, first, however, made in Leicestershire. Pop. (1901) 535.

Stilts, poles with stirrup-like projections for the feet placed at some distance from the bottom, and used for walking over rough ground. They are now mainly a means of diversion, especially amongst boys. In ancient days

they are said to have been employed in the scaling of castles and high walls. In the marshy tracts of the French Landes the shepherds in former times spent the day on stilts. In the upper parts of the Tweed and the Clyde they are resorted to for crossing dryshod from one bank to another. Tournaments have been held with the rival parties mounted on stilts. In the Fen districts of England they were formerly a good deal in use. At the New Year in the Chinese town of Newchwang it is customary for a section of the community to walk and hop along the streets on stilts, dressed in gala attire, with banners flying and drums and tom-toms beating.

Stimulants, medicinal agents which increase the functional activity of a living organ, and which, at least in some cases, induce slightly increased irritability of living tissues. The term should not be restricted to drugs, much less to alcohol alone, as it too often is. Cold baths, fresh air, and exercise are the best stimulants, and increase the tone and vigour of the whole body. Cardiac stimulants, such as digitalis and strophanthus, increase the vigour of the heart; respiratory stimulants, such as strychnine and ammonia, accelerate the breathing; nerve stimulants may be divided into cerebral, such as opium (in small doses) and caffeine, and spinal, such as nuxvomica and ammonia, both of which increase the excitability of nerve cells; gastric stimulants, such as aromatics and alkalis, induce the secretion of gastric juice and aid digestion; salivary stimulants, such as spices and bitters, cause increased flow of saliva and promote the appetite; while vascular stimulants, such as ether and ammonia, give tone to the blood-vessels and raise the blood pressure. Drugs such as alcohol may be primarily stomacheal tonics by stimulating the salivary and gastric glands, while after absorption they stimulate the heart and vessels as well as the system generally. Much has been written for and against the administration of alcohol in health and disease. The rational view would seem to be that alcohol is not necessary in health; but in moderate doses it is a food, and by exciting appetite and promoting digestion it assists in the assimilation of other foods. In many diseases it is unnecessary, in some positively harmful, but in a few it is of service in combating prostration, in strengthening the heart, in lowering the temperature, and in producing sleep. The administration of alcohol in disease is advantageous if under its influence (1) the tongue be-

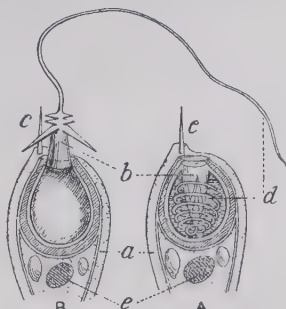
comes more moist, (2) the pulse is retarded, (3) the skin acts more freely, (4) the respiration is tranquillized, and (5) delirium diminishes and sleep supervenes. The most suitable form of alcohol in disease is generally well-diluted old whisky or brandy, although in some cases a light, sparkling dry wine is more readily tolerated and more rapidly diffused.

Sting-fish. See WEEVER.

Stinging-animals, in attacking their prey or protecting themselves from their enemies, aim to introduce a poison into the blood or body-fluid of the organism attacked. There must, therefore, be two elements in the organ—a poison-gland and an organ for piercing the superficial tissues. With the exception of the Ctenophora, all the Coelentera possess stinging-cells of the type described below, but relatively few of them are capable of stinging man. The British anemones cannot sting the fingers, but it is stated by Gosse that a distinct stinging sensation is felt if the tentacles be touched by the more sensitive tongue. Venomous snakes are dangerous just in proportion as their fangs are specialized so as to ensure the introduction of their poison into the blood system. Stinging-cells are found also in some Turbellaria and in some nudibranch gastropods. In the latter case it is believed that the stinging-cells have been obtained from the sea-firs, etc., upon which the molluscs feed, and are not independent structures. In bees, wasps, and the related insects the sting is a modified ovipositor. In spiders the sting is lodged in the first pair of appendages. In the scorpion the telson, or last piece of the body, forms the sting. It lodges a poison-gland, and ends in a sharp point, by means of which the skin of the animal attacked is pierced. Among vertebrates stinging organs are not uncommon among fishes—e.g. sting-ray, weever.

Stinging-cells, or **CNIDOBlasts**, are the organs by means of which the Coelentera paralyze their prey or protect themselves from their enemies. In the Hydra, for example, each cnidoblast is a rounded cell, containing protoplasm and nucleus, in addition to an oval bag filled with fluid. The bag is the thread-capsule (nematocyst), and contains a long hollow thread, which lies in the fluid. The cell has a little trigger (cnidocil) projecting from its free end. If the trigger be touched the cell contracts, and as the fluid in the thread-capsule is incompressible, the first result is that the thread is shot out; if the pressure be continued,

the whole capsule may be also pressed out. The fluid in the bag is poisonous, and as the thread before expulsion is bathed in this

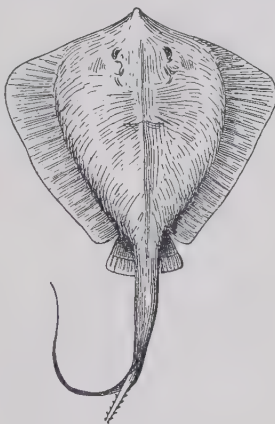


Sting-cells from Hydra.

A, Nematocyst before discharge; a, after. a, Cnidoblast with nematocyst (b); c, trigger hair; d, filament; e, nuclei, with nerve cell on each side.

fluid, when it penetrates the skin it carries with it some of the poison. The cnidoblasts of coelenterates are usually arranged in clusters or batteries, such batteries, for instance, forming the blue beads seen at the base of the tentacles in the common smooth sea-anemone (*Actinia mesembryanthemum*).

Sting-ray, the name given to the members of the elasmobranch fish family Trygonidae, most of which bear on the tail a strong serrated spine, capable of inflicting a dangerous wound. It may reach a length of eight or nine inches, and is renewed from time to time like the poison fangs of a snake. The wounds which it



Sting-ray.

inflicts are very painful, and inflame rapidly. There is no definite poison-gland connected with the spine. The pectoral fins are continued round the head region

without interruption, and unite at the extremity of the snout. The tail is long and slender. A considerable number of species of sting-ray exist, the majority belonging to the genus *Trygon*. One species of this genus (*T. pastinaca*) occurs off the south coast of England, and extends thence through the Atlantic and Pacific Oceans. As a rule, however, the sting-rays are confined to warm seas.

Stinkwood, the wood of the South African trees, *Ocotea bulbata*, belonging to the order Lauraceæ, and *Celtis kraussiana*, belonging to the order Ulmaceæ. The former is golden brown in colour, often mottled and iridescent. It is very tough, strong, and durable. It is now rare, but is valuable for building wagons and for making gun-stocks. The latter is a beautifully veined, greenish wood, heavy and close-grained, but liable to warp.



Stint.

Stint, a name applied to some species of sandpiper. The little stint (*Tringa minuta*) occurs in Britain as a migrant. It reaches a length of only six inches, and is like a miniature dunlin, save that there is no black upon the breast. The American stint (*T. minutilla*), a still smaller species, of darker colour, has been known to occur in Britain, while Temminck's stint (*T. Temminckii*), which resembles a small common sandpiper, is an occasional visitor.

Stipa. See FEATHER GRASS.

Stipend. In its most general sense a stipend is an annual payment for performing the duties of an office. In its more restricted and technical sense stipend means the annual provision made for the support of parish ministers in Scotland. In the case of old parishes the stipends are paid out of the teinds. Except where the teinds have been valued and surrendered, they are payable (under 48 Geo. III. c. 138) at the highest fiars prices of the county, half at Whitsunday and half at Michaelmas. The Court of Session has power to augment a stipend once in twenty years if there are surplus teinds in the parish upon which to charge the increase; and in the case of stipends under £150, or under

£200 with neither manse nor glebe, the court may make the stipend up to £150 or £200, as the case may be, out of public funds provided under the Acts of 1810 and 1824 (50 Geo. III. c. 84, and 5 Geo. IV. c. 72), so far as these funds extend, but already all the money so provided has been applied. In the case of *quoad sacra* parishes the stipends are paid at Whitsunday and Martinmas out of the endowments, which have to be secured to the satisfaction of the Court of Teinds before the court allows a church to be erected into a parish church and attaches a district to it (7 and 8 Vict. c. 44, s. 8). In the case of additional places of worship in the Highlands and Islands (4 Geo. IV. c. 79, and 5 Geo. IV. c. 90) the stipends are paid at Whitsunday and Michaelmas out of money provided by the Treasury under the acts.

Stipendiary Magistrate. a paid magistrate, appointed by the Home Office, in municipal boroughs and in places of 25,000 population. He has all the powers of two justices. Under the Municipal Corporations Act, 1882, he is required to be a barrister of seven years' standing; and under the Stipendiary Magistrates Act, 1863, of five. In London paid magistrates are appointed by the name of metropolitan police magistrates. In Ireland there are police magistrates in Dublin, and resident magistrates in the counties, who are in a similar position.

Stipules of a plant are appendages, usually in pairs, situated at the base of the petiole or leaf-stalk. If they are attached along each side of the leaf-stalk, as in the rose, they are said to be adnate. If they form a kind of sheath enclosing the stem, they are called an ochrea. If they resemble leaflets in appearance, they are said to be foliaceous. Sometimes they are modified into thorns or spines.

Stirbey, BARBO DIMITRIÉ, PRINCE (1801-69), whose real name was Bibescu, Roumanian statesman. From 1844-7 he was minister of the interior, and from 1849 to 1856 hospodar of Walachia, when he abdicated, and voted for the union of the principalities.

Stirling, roy. and parl. bur., river port and cap. of co. of same name, Scotland, on r. bk. of the Forth, above the 'links,' 36 m. W.N.W. of Edinburgh. It occupies the slope of a basaltic knob, whose steep western extremity is crowned by the ancient castle, the scene of royal births and royal deaths, and the murder of William Douglas by James II. in 1452. The palace, the chapel royal, and the Parliament House are in the castle courts. In the vicinity are

Sauchieburn, Bannockburn, Stirling Brig, Sheriffmuir, and Cambruskenneth Abbey. Snowden, the official name of one of the Scottish heralds, is the descriptive name of Stirling. As the 'key to the Highlands,' Stirling Castle was frequently attacked, particularly in the reigns of Edward I., Edward II., and Edward III. It was captured by General Monck in 1651, and was unsuccessfully besieged by the Jacobites in 1745. The town has manufactures of leather, carpets, furniture, oils, and rubber goods. It unites with Dunfermline, Culross, Inverkeithing, and Queensferry to send one member to Parliament. Pop. (1901) 18,403.

Stirling, JAMES HUTCHISON (1820), Scottish philosophical writer, was born at Glasgow. His reputation was made by a work on *The Secret of Hegel* (2 vols, 1865; new ed. 1893), which marks the beginning of the serious study and influence of German idealism in Britain. In the same year he published a severe criticism of Sir William Hamilton's philosophy. Another important work on German philosophy was his *Text-book to Kant* (1881). Among his numerous other writings may be mentioned a pamphlet, *As regards Protoplasm* (1869), in which he replied to Huxley's views on the physical basis of life; two works, *What is Thought?* (1900) and *The Categories* (1903), in which he gives more direct expression to his own philosophical views; and an annotated translation of Schwegler's *History of Philosophy* (1867), which has passed through several editions. Stirling was the first Gifford lecturer at Edinburgh.

Stirling, MRS. MART ANNE (1815-95), English actress, was born in London; early appeared on the stage, and acted until 1870. Her impersonations in high comedy were in the grand manner. Her greatest parts were Peg Woffington, Mrs. Candour, Mrs. Malaprop, and the Nurse. She married in 1833 Edward Stirling, and on his death (1894) became Lady Gregory.

Stirling, WILLIAM ALEXANDER, EARL OF (1567-1640), Scottish poet, was born at Menstrie, near Alva. He initiated his poetical career by the production of a series of four Monarchie tragedies—*Darius* (1603), *Cræsus* (1604), *The Alexandrian Tragedy* (1605), and *Julius Cæsar* (1607)—in direct imitation of the Greek drama. In 1604 he also published *Aurora*, a collection of sonnets and madrigals. His other great poem, *Doomsday*, appeared in 1614 and 1637. He is principally remembered, however, as one of the group of Scottish

poets (led by Drummond of Hawthornden) who abandoned their own vernacular and modelled their style on their English Elizabethan contemporaries. He was made master of requests in 1614, secretary of state for Scotland in 1626, and was successively created Earl of Stirling (1633) and Earl of Dorn (1639). He also filled the office of keeper of the signet, and was a lord of session. See the Glasgow edition of his *Poems* (1870); also the *Memoirs* by Charles Rogers (1877).

Stirling-Maxwell. See MAXWELL.

Stirlingshire, midland co., Scotland, covers an area of 451 sq. m. The E. portion is undulating and highly cultivated, the carse of Stirling and Falkirk occupying some 56,000 acres of the finest agricultural land in Scotland. Oats are the staple crop. The W. portion, particularly the N.W. projection along the shores of Loch Lomond, is generally considered a part of the Highlands. Ben Lomond reaches 3,192 ft. Other elevations are the Campsie Fells, Fintry Hills, Gargunnock Hills, and Strathblane Hills. Nearly half of Loch Lomond belongs to the county. Coal-mining is the chief industry. Ironstone is also mined, and iron-founding is carried on, especially at Carron and Falkirk. Woollen manufactures, calico-printing, and bleaching are also important. Stirling is the capital. The county returns one member to Parliament. The battles of Stirling Bridge (1297), Falkirk (1298), Bannockburn (1314), Sauchieburn (1488), Kilsyth (1645), and the second battle of Falkirk (1746) were all fought within its borders. Antoninus's wall is among its antiquities. Pop. (1901) 142,291.

Stitch, a sharp thoracic pain which renders breathing difficult and distressing. It may be due to neuralgia, to pleurisy, or to pericarditis; but when produced by running it seems to depend on fatigue-spasm or localized cramp of some of the diaphragmatic or intercostal muscular fibres.

Stitch. See KNITTING, DRESS-MAKING, SEWING-MACHINES.

Stitchwort. See STELLARIA.

Stiver (Dutch, *stuiver*), two small coins at one time current in Holland and the Dutch colonies—a silver coin, the twentieth part of a guilder; and a copper coin, current only in the Dutch colonies. The word is now used for any coin of little value.

Stjernhjelm, GEORG (1598-1672), Swedish poet and scholar; served as assistant judge in Livonia till 1642, when he came to Sweden to participate in the forming of a code of laws, and was made keeper of the public records.

From 1648 to 1656 he was vice-president of the supreme court at Dorpat. His ready wit, learning, and versatility made him a favourite with Queen Christina, and he was for a time one of the chief ornaments of her brilliant court. He is called the father of Swedish letters, being the first poet to cultivate his mother tongue. His chief works are the didactic poem *Hercules* (1653), and the wedding poem, *Bröllops-besvär*s *Ihugkommelse*.

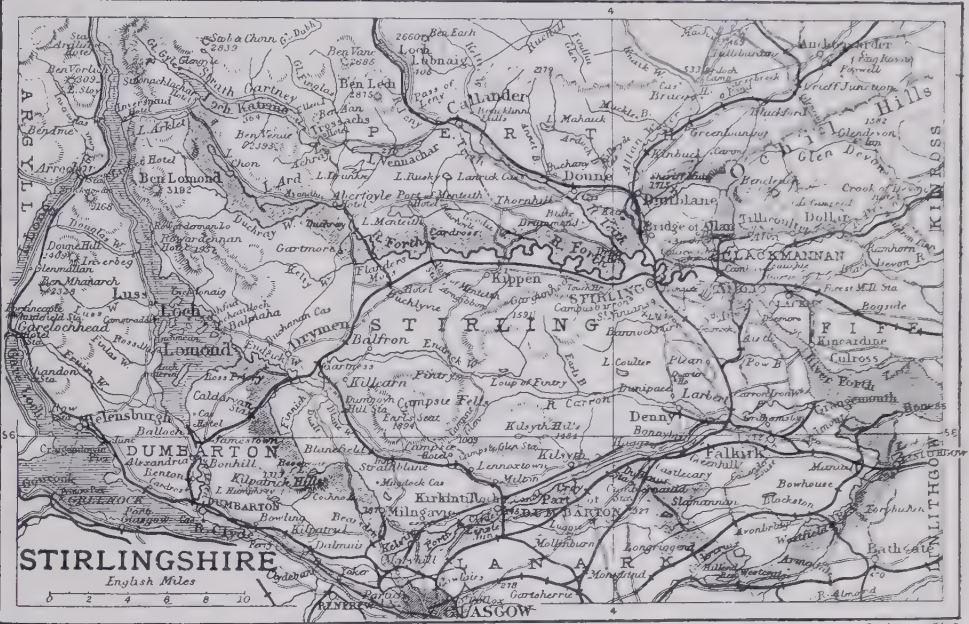
Stoat, or **ERMINE** (*Mustela erminea*), a small carnivore, closely related to the weasel, from which it chiefly differs in its larger size, and in the fact that the tip of the tail is black

The stoat has a fetid smell, particularly noticeable when it is irritated.

Stobæus, **JOHANNES**, a writer who lived after 500 A.D., formed a valuable collection of extracts from Greek literature. The *Eclogues* contain extracts on physics, dialectics, and ethics; and the *Anthologium* subjects of a moral, political, and economical character, with practical maxims for conduct. Editions: *Eclogues*, by Heerer (1792-1804); *Anthologium*, by Wachsmuth and Hense (1884-94); the whole, by Dindorf (Teubner Series).

Stobs. See **HAWICK**.
Stock Exchange. At the time of the South Sea Bubble of 1720,

members, attends to the general working of business. The capital is composed of 20,000 shares of £12 each paid, with unlimited liability, and which pay a dividend generally of about £8 per share. The holding of any one shareholder is limited to 200 shares. These shares are only transferable to members. The members are divided into two classes—brokers and jobbers. The broker is he who transacts the business for the public, charging commission as agent. The jobbers are supposed to have no outside clients, but to confine their dealings entirely to brokers, to whom they act the part of principals. Each jobber confines himself to



both in the summer and the winter dress. Like the weasel, the stoat is distributed over the more northerly regions of both hemispheres; but it is only in the extreme northern part of its



Stoat.

range that it develops the dense winter coat which is so highly valued by furriers. Stoats attack hares, rabbits, game-birds, and poultry; but destroy rats, mice, voles, and similar small vermin.

brokers in London carried on their operations at Garraway's coffee-house in Change Alley and at other temporary meeting-places. Out of this eventually grew the stock exchange of the present day, with its 5,400 members. Brokers at first engaged in other businesses as well; now they are not allowed to do so by the rules of the stock exchange, which are very strict in every way. The exchange is managed by two committees. That appointed by the shareholders, acting in the capacity of directors, but called managers, exercises its functions over everything connected with the building and its upkeep. The other, the committee for general purposes, elected annually by the

dealing in certain classes of stocks and shares, and quotes his prices at such figures as to give him a fair chance of making a profit whichever way he deals. For example, he would quote a price 97½ to 97¼—i.e. he is prepared to buy at 97½ and to sell at 97¼. An applicant for admission to the exchange must not be under twenty-one years of age, and must pay an entrance fee of 500 guineas; must acquire three shares in the Stock Exchange (Company); and must find three members to become sureties for £500 each for four years, in the event of his defaulting during that period. Over and above this, he must have previously acquired, with the consent of the committee, a

retiring or a deceased member's 'nomination' of membership; and this, at 1st December 1904, was valued at £600. The committee reserve the right to nominate a certain number of clerks every year who have served four years in the 'house.' Such clerks have to enter their names on a 'waiting list' to be balloted for, and if elected, they pay an entrance fee of 250 guineas, and find two sureties of £300 each for four years. They must also qualify with one share in the Stock Exchange (Company). In their case a 'nomination' of membership is not required. No member can be surety for more than two new members at the same time. All new members pay an annual subscription of forty guineas; but those elected before March 25, 1876, pay twenty guineas, and those elected before March 25, 1899, thirty guineas. Every member is entitled to have three clerks (approved of by the committee) admitted to the exchange to help him, and for whom he has to pay certain entrance and annual fees over and above his own yearly subscription. These clerks are divided into two classes—'authorized' and 'unauthorized.' The latter, again, are divided into 'house' clerks and 'settling room' clerks. The former are authorized to transact business for their employers, but the unauthorized are debarred from dealing; their duties are to check the transactions of the previous day, etc. A special badge is worn by these clerks when engaged in the 'house,' and all other clerks, as well as the outside public, are forbidden entrance.

The nature of business transacted may be divided under four heads. (1.) Investments. These are purchases made purely for return on capital, and not so much with the view to enhancement of values. (2.) Speculative investments, which may or may not be dividend-yielders. These purchases are made more with the view to improvement in price. Very frequently such purchases are taken up by banks for their customers on a margin of ten per cent. of the actual value, if quoted in the official list; otherwise a greater margin would be required. This margin is called 'cover.' The stock in such cases is registered in the bank's name. The rate of interest on such loans varies with the bank rate, and is generally one per cent. over it. The banks insist upon the margin being well maintained, and have the power, if such be not forthcoming, of selling the stock to protect themselves. Such transactions are often arranged by the brokers with their own bankers for their clients. (3.) Specula-

tion pure and simple is gambling on the rise and fall in prices of stocks and shares. A purchaser in this class of dealings has no intention of paying for his purchases, or the seller of delivering what he may have sold. The terms 'bull' and 'bear' are the names commonly used in such operations. The bull is the one who buys for a rise, and who either cannot pay or does not intend to pay for his stock; the bear is he who sells what he has not got, in the hope of buying back on a fall. In such dealings the speculator, if he buys or sells at the commencement of an 'account' (as the stock exchange settlements are called), has a fortnight's run of the stock. At the end of that time, unless he has already closed the bargain, he must make arrangements with his broker to 'carry over' his stock into another account, giving him another fortnight's run. The carry-over charge is called a 'contango,' and varies with the bank rate and the supply and demand in the stock or shares the speculator may be dealing in. If he is a bull and does not wish to pay for the stock himself, his broker will either arrange with a jobber to continue the stock, or will get a bank or a money-lender to do it for him, paying a contango or rate of interest for the privilege of being allowed extension of time. The position of the bear of stock or shares operates in a directly opposite way. At carry-over time he reaps the benefit, getting the contango the bull has to pay. When there are more bears at the carry-over time, brought about by sellers not having repurchased, and purchasers of the stock having determined on paying for what they have bought, the bear will be forced to pay heavily for the privilege of deferring delivery of his stock. This charge is known as a 'backwardation.' And this state of affairs, carried to a certain point, becomes what is known as a 'corner' in the stock, forcing the bears, through withdrawal of carry-over facilities, to buy back their stock at much enhanced prices. 'Lender' or 'giver' is the name used for the bull at carry-over time, and 'borrower' or 'taker' that used for the bear. (4.) Options are another method of speculative dealing. In a call option a contract is entered into, giving the holder of same for a certain consideration the right to call or demand a sale to him of a certain stock on a specified date. The call may be for any agreed time, and whatever the price may have risen to in the interval, the granter of the option must be prepared to deliver such stock or shares at the price fixed on the day that the option was granted.

The charge for such an option varies according to the price and liability to fluctuation of the stock and the length of option period. All the purchaser of an option can lose is the consideration he has paid for it, plus the broker's commission. The put option is the direct opposite of the foregoing, and is a sale contracted for a specified date ahead for the privilege of delivering a named stock or share at the price contracted for. There is another combination called a 'double option,' which, however, is not very often dealt in. It means a put and call option in the same stock.

'Settlement day' occurs about every fortnight, in the middle and end of each month, when all purchases and sales made during the account must be completed, or carried over to the next settlement. Four days are occupied in the arrangement of the 'account.' The first day is devoted to arranging the carry-over in mining shares; the second day to the general carry-over—i.e. of railway stocks, foreign bonds, and miscellaneous shares. At midday on this day, prices of all active stocks and shares are fixed at the actual midday prices ruling at the time, with the exception of mining shares, the prices of which are fixed the day previous. This means the fixing of a uniform price for each stock, to adjust all the dealings that have taken place during the account. The third day is 'ticket day' or 'name day,' when all purchasers' names must be issued for the stocks or shares that have to be paid for. Those for mining shares must be arranged and issued the day before the ticket day proper. But the more active are taken over by the clearing-house, which brings deliverer and purchaser together. The fourth day is the 'settling day,' on which all outstanding accounts must be settled. Actual purchases and sales are also settled for on this day and subsequent days. 'Bearer' stock, or 'scrip' as it is called—such as all American railway shares and bonds, foreign government bonds, etc.—must be delivered to the purchasers not later than the day following settling day. This only applies to scrip; the delivery of stocks and shares by transfer is extended up to ten days. It often happens that a broker may have to pay for stock with money to be derived from the sale of registered stock, and that the purchaser's name does not come in to time, in which case he employs the official broker to sell out by auction on the market to the highest bidder for an immediate name. All loss and commission falls on the party

responsible for the delay. Again, if a purchaser does not receive delivery of registered stock within ten days of the settling day, he has the right to buy in by auction, again employing the official broker. The loss falls on the party holding the name-ticket over. The settlement in consols occurs once a month, and transfers of stock must be signed in the bank's books at the Bank of England by the seller or by a power of attorney.

Owing to the exchange closing at 4 p.m. and 4.30 on settling days and 1 p.m. on Saturdays, members continue their dealings in the 'street'—the American market going on in Shorters Court, and the other markets in Throgmorton Street. When a member of the exchange defaults, not being able to meet his liabilities, he has to go through the process of being 'hammered.' The word arises in this way. One of the waiters of the exchange mounts the rostrum, and after giving three taps with a mallet, so as to attract the attention of the house, he announces that Mr. So-and-so has not complied, or begs to inform the house that he cannot comply, with his bargains. An official assigner with a staff of clerks is permanently engaged by the exchange to look after and adjust the accounts of defaulting members.

Shares in new companies are dealt in for special settlement, which may mean a delay of a month or much longer before the dealings are settled. This also applies to fresh issues of shares by old companies. 'Par' means a price equivalent to the amount paid on a partly-paid share or stock. When fully paid, stock is rarely quoted 'par,' but at the market price—e.g. a £1 share would be quoted $\frac{1}{2}$ to 1½. 'Discount' means the price of shares is selling under par. 'Gilt-edged' securities mean that the interest payable on such is as safe as it is possible for any income-producing investment to be. A 'stag' is one who applies for shares in a new issue or company, in order to sell immediately on allotment at a profit. To 'rig' means to inflate unduly a security by fair means or foul. These methods are generally practised by the company-promoting fraternity. A 'stale bull' is one who has carried over stock for a long time. A 'stale bear' is a bear who has been short of stock for a considerable time. 'Parity' means the prices of foreign stocks and shares dealt in in London after the various rates of exchange have been adjusted. The 'tape' is the name given to a very ingenious machine owned by the Exchange Telegraph Company,

and found in the majority of brokers' offices. It is worked from one central source, and prints on a narrow winding strip of paper the changes in all the principal stocks and shares as they occur during the day.

Provincial exchanges are conducted on much the same lines as the London exchange, members requiring to find sureties. The principal foreign exchanges or bourses are Paris, Berlin, Vienna, Amsterdam, Antwerp, Brussels, and New York. The Paris bourse is an important centre for mining shares and foreign government securities. A wise course is followed there in compelling sellers of certain classes of bonds to give the distinctive numbers upon their bonds when sales are made. This prevents bear raids being made on such securities. Russian bonds, for instance, come under this rule. The same applies to dealings in bank shares in Britain. There are no jobbers in the Paris market, brokers dealing direct with brokers. The Berlin market is framed somewhat after the Paris bourse, there being no jobbers. The dealings are largely in foreign bonds and American securities. In the New York exchange dealings are almost exclusively confined to American railway, industrial, and mining companies. There is a large interchange of business between London and this market, as American securities are very largely dealt in over here. The members who do business by cable with New York are known as 'arbitrage dealers'—i.e. buying or selling American railway shares or industrials in New York, and undoing the bargains here at a profit if possible. There are no jobbers in the New York market. As their dealings are only in scrip or bearer securities, they settle their bargains every day, and speculative business must be arranged and carried over from day to day. 'Long' and 'short' are the corresponding terms used in America for bull and bear.

'Bucket-shops' is a slang term imported from the United States, and is applied to outside stock-brokers' offices. These brokers are not under the control of the stock exchange or its committee. They advertise largely in the newspapers. Members of the stock exchange are forbidden to advertise, and the same rule applies to provincial exchanges. Many outside brokers profess to do business free of commission, but this is only a snare to catch the unwary.

The *Stock Exchange Official Intelligence*, issued annually by the stock exchange, and the *Stock Exchange Year Book*, are by far the most reliable books of reference. See also *Weekly Official*

Intelligence, and C. Duguid's *Story of the Stock Exchange* (new ed. 1905).

Stock-fish, gadoid fish, such as cod, ling, hake, haddock, and torsk, which are cured by splitting and drying till hard, without the use of salt. This is extensively carried out in Norway and Greenland.

Stockhausen, JULIUS (1826), French baritone vocalist and teacher of singing. He studied singing under Manuel Garcia; made his début in London in 1848; was equally successful in oratorio, opera, and on the eccentric platform; and for many years had an unrivalled reputation as an exponent of the songs of Schubert and Schumann. In 1878 he was appointed professor of singing in the conservatorium, Frankfurt-on-Main, but in 1880 resigned that position, and devoted himself to private teaching.

Stockholm, cap. of Sweden, romantically situated on islands in Lake Mälaren and on the adjoining arm of the Baltic. It is composed of a central portion (Staden); Södermalm, the southern suburb; Normalm, the northern suburb; Kungsholm, to the west of Normalm; Östermalm, containing the barracks; and Skeppsholm, with the arsenal and headquarters of the Swedish navy. Chief public buildings and monuments—the Riddarholm Church (the Westminster Abbey of Sweden), the Parliament house, the Riddarhus or house of the nobility, the opera house, the royal palace (built by the Tessins in 1697-1753, a vast square in the noblest neo-Italian style), the palace of the governor-general, the crown prince's palace (1783-93), the Academy of Sciences, the observatory, the National Museum, and the Royal Library, with about 300,000 vols. The city is remarkable for its numerous beautiful promenades and delightful views, especially on the Djurgård, with its outdoor museum illustrative of the national life, and the Scandinavian (northern) museum. The industries include sugar refineries, tobacco, silk, stearin, and tallow factories, linen and cotton weaving and spinning, and iron foundries. Stockholm has a small export trade in iron, timber, and tar, but a large import trade. The harbour is closed by ice from three to five months every year. In the environs are several very beautiful royal châteaux in picturesque parks—e.g. Haga, Ulriksdal, and Drottningholm. Stockholm dates its origin from 1187 and 1255. In 1389 it was besieged and taken by Margaret of Denmark. In 1471, almost under its walls, the administrator Sten Sture gained a

brilliant victory over the Danes. Christian II. of Denmark took the town in 1520, and in November of the same year massacred hundreds of Swedish magnates and burgesses there in order to crush the national resistance. Pop. (1900) 300,624.

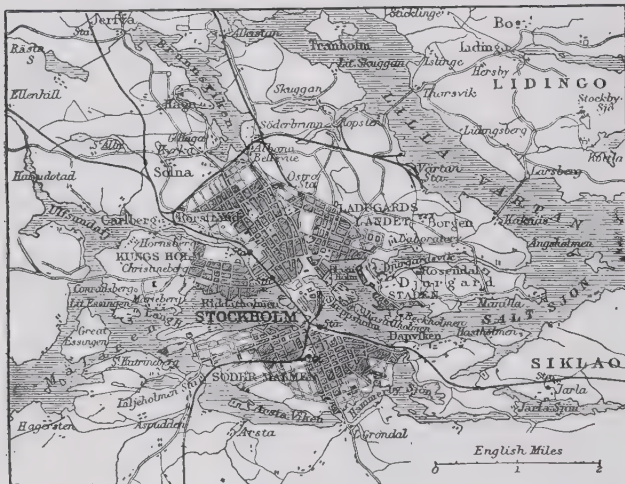
Stockings. See KNITTING.

Stockmar, CHRISTIAN FRIEDRICH, BARON VON (1787-1863), German statesman and physician, was born at Coburg; appointed (1816) physician to Prince Leopold of Coburg, subsequently holding the positions of his secretary, keeper of the privy purse, and comptroller of the household. He also took part in the negotiations which led to Leopold's marriage with the Princess Charlotte, and to the elevation of Leopold to

incorporated in the borough in 1901. Stockport returns two members to the House of Commons. Pop. munic. bor. (1901) 92,832.

Stocks, an appliance made of wood, and consisting of an upper and a lower section, attached to each other by a hinge at one end. It was formerly used as a means of punishing vagrants, sturdy beggars, and disorderly persons. The feet were placed through holes cut at the junction of the two sections, and the delinquent was left to sit there for a period exposed to the ridicule, and sometimes the missiles, of the parish loafers. The stocks seem to have been introduced into England in the reign of Edward III.

Stocks. See NATIONAL DEBT, STOCK EXCHANGE, STOCKBROKER.



Stockholm.

the throne of Belgium (1831), and was one of those who arranged the marriage of Queen Victoria to Prince Albert (1840). See his *Denkwürdigkeiten* (1872), and Juste's *Le Baron Stockmar* (1873).

Stockport, munic., par., and co. bor., chiefly in Cheshire, partly also in Lancashire, England, 6 m. S.E. of Manchester. It is built on both sides of a ravine through which flows the Mersey. A viaduct, 1,780 feet long, carries the L. & N.W.R. over the town. The church of St. Mary, in great part rebuilt early in the 19th century, is an ancient foundation with 13th-century chancel. Vernon Park is the principal recreation ground. There is a bronze statue of Richard Cobden, M.P. (1841-7) for the borough. There are cotton manufacture, hatmaking, ironfounding, machinery, and brewing. The township of Reddish was

Stockton. (1.) Post town, co. Gloucester, N.S.W., Australia, 4 m. N.E. of Newcastle, with limekilns, sawmills, shipbuilding yards, coal-mining. Pop. (1901) 2,549. **(2.)** City, California, U.S.A., co. seat of San Joaquin co., in the valley of Sacramento, 70 m. E.N.E. of San Francisco. Manufactures agricultural implements, lumber, and flour. Pop. (1900) 17,506.

Stockton, FRANCIS RICHARD (1834-1902), American novelist and writer of children's stories, born in Philadelphia. He became a wood engraver, but soon turned to literature. Many of his stories appeared first in *Scribner's Monthly*. The best known are *Rudder Grange* (1879) and *The Lady or the Tiger* (1884). His works are published in the Shenandoah edition. See *Memorial Sketch*, by his wife, in *The Captain's Tollgate* (1903).

Stockton-on-Tees, munic. and parl. bor. and port, Durham, England, 5 m. from head of Tees estuary. The public buildings include town hall, exchange hall, freemasons' hall, free public library, and hospitals. An iron bridge (1887) connects with S. Stockton (Yorks). Ropner Park was opened in 1893. The extensive industries include blast furnaces, rolling mills, construction of marine engines, bridge-building, railway material, shipbuilding, and glass-bottle works. The Tees navigation has been greatly improved, and vessels drawing twenty feet can reach the town. The Stockton and Darlington Ry., opened 1825, was the first constructed in the United Kingdom. A castle was built here soon after the conquest; it was taken by the parliamentarians in 1644. Stockton returns one member to the House of Commons. Pop. (1901) munic. bor. 51,478; parl. bor. 71,815.

Stoddard, RICHARD HENRY (1825-1903), American lyric poet, born at Hingham, Massachusetts. He was employed in the custom house from 1853 to 1870. He married Elizabeth Barstow, the novelist, in 1851. His first volume, *Footprints*, was published in 1849. His chief works are *Poems* (1852); *Adventures in Fairyland* (1853); *Songs of Summer* (1857); *The King's Bell* (1862); *The Book of the East* (1867); *Abraham Lincoln, A Horatian Ode* (1865); *Putnam the Brave* (1869); and *A Century After* (1876). He has also written *Lives of Humboldt* (1860) and *Washington Irving* (1886). See his *Recollections* (1903).

Stoddard, ANDREW ERNEST (1863), English cricketer, born at S. Shields. He first gained celebrity as an international three-quarter back at Rugby football. He became a member of the Middlesex cricket team (1885), and from that time until 1897 he was one of the leading batsmen. He took an eleven out to Australia (1894), when he won two victories to the colonists' three. He captained another team (1897), when the Australians won by four matches to one. He made the third highest score on record, 485, for Hampstead v. Stoics, Aug. 4, 1886.

Stoddard, THOMAS TOD (1810-80), Scottish angler and poet, was born in Edinburgh, and settled in Kelso as a follower of Izaak Walton. He published *The Art of Angling* (1835), *The Angler's Companion* (1847), a classic, and some genuine poetry in *Angling Songs* (1839), and *Songs of the Seasons* (1873). See his *Autobiography* (1881).

Stoicism, Athenian school of philosophy, founded not long after the death of Aristotle,



Views in Stockholm.

1. Opera House. 2. Royal Library. 3. Riddarholm Church, interior. 4. National Museum. 5. Riddarhuset (Hall of the Knights).
6. General view of city. 7. Royal Palace. 8. Arfurstens Palats. 9. Palmeskahuset.

derives its name from the *stoa* or porch in which its founder, Zeno of Citium in Cyprus (fl. c. 300 B.C.), taught. His successors at the head of the school were Cleanthes, whose hymn to Zeus is quoted in St. Paul's speech at Athens, and Chrysippus (280-207 B.C.). The latter's work in developing and expounding the doctrine of the school was so important that he was regarded as a second founder. A more eclectic and moderate phase of Stoic teaching was initiated by Panaetius of Rhodes (fl. c. 140 B.C.), one of whose writings formed the basis of Cicero's treatise *De Officiis*. Of all the Greek schools Stoicism was that which was most congenial to the Roman temper, and in its latest period some of its most famous names were those of Romans, such as Seneca (3-65 A.D.), and the emperor Marcus Aurelius (121-180). Epictetus, another famous Stoic, comes intermediate between these in date.

Like the rival system of Epicurus, Stoicism was essentially a practical philosophy; but it had its metaphysics as well as its ethics. This metaphysics was a pantheistic materialism. All reality is material, the Stoics held, but within it are to be distinguished matter proper, which is passive, and the animating or active principle, God or reason, which, though so termed, is conceived as simply a finer kind of material entity, an all-pervading breath or fire, such as Heraclitus supposed the cosmic principle to be. With this divine principle the soul of man is akin, or rather is identified, as a part with the whole to which it belongs. In this metaphysical view two important ethical consequences are involved. First, the maxim of 'living according to nature' or 'reason' comes to mean living in conformity with the divine order of the universe. And the importance of this positive guidance is seen in the great part which Stoicism played in building up that conception of a law of nature by which Roman jurisprudence was so powerfully affected. (See Maine's *Ancient Law*, ch. iii.) And second, the doctrine that all that happens is according to the divine order, and therefore for the best, involves a thoroughgoing optimism. The real source of the Stoic ethics, however, is not any metaphysical theory, but the practical ideal already proclaimed in Cynicism—the ideal of the wise man after the pattern of Socrates, who perceives that the true good of man lies not in outward objects, but in the state of the soul itself, in that knowledge or wisdom by which he is delivered from the passions and desires that perturb the life of the ordinary man. At

first, indeed, Stoicism had a good deal of the Cynic harshness of view. The wise man was separated by an absolute gulf from the unwise, and all external things were utterly indifferent to the wise man. But the more rigid dualisms of early Stoicism were gradually relaxed by the introduction of new distinctions. By means of such distinctions the life of Stoic virtue was able to adapt itself tolerably well to the necessities of its environment. And so far, indeed, was such accommodation carried that in later Stoicism a reaction set in towards a more cynical ideal. Stoicism of the latest or Roman period was characterized by its strongly practical and religious tendency, as in the *Discourses* and *Encheiridion* of Epictetus, and the *Thoughts* or *Meditations* of Marcus Aurelius. On Stoicism generally, see Cape's *Stoicism* (1880) and Zeller's *Stoics* (trans. 1892).

Stoke Poges, vil., Buckinghamshire, England, 2 m. N. of Slough station (G.W.R.). The ancient church of St. Giles contains a canopied tomb and 14th and 15th century brasses. On the s. is the Hastings chapel. The poet Gray is interred in the churchyard, believed to have been the scene of his *Elegy*. Pop. (1901) 3,175.

Stokes, SIR GEORGE GABRIEL (1819-1903), Irish physicist, was born at Skreen, Co. Sligo. In 1837 he entered at Pembroke College, Cambridge, and in 1841 graduated as senior wrangler and Smith's prizeman, and was elected a fellow of his college. Stokes devoted himself to the mathematical investigation of physical problems, primarily in hydrodynamics. In 1849 he published his researches on the dynamical theory of diffraction, and was shortly afterwards appointed Lucasian professor of mathematics. His subsequent labours were chiefly in the field of optics, his most important investigation being on fluorescence, and the fact that the refrangibility of light is in general reduced by the dispersion caused by fluorescent substances is known as Stokes's law. He became secretary of the Royal Society in 1854. He published researches on double refraction, the effect of wind on the propagation of sound, along with investigations in pure mathematics. Stokes was M.P. for Cambridge University, president of the Royal Society, and master of Pembroke College. See his collected *Mathematical and Physical Papers* (1880-1905).

Stokes, WHITLEY (1830), Anglo-Indian official and Irish philologist, born in Dublin; became a barrister of the Inner Temple (1855), and went to India (1862),

where he was law member of the council of the governor-general (1877-82). His books include *Irish Glosses* (1860), *Goidelica* (2nd ed. 1872), *The Tripartite Life of St. Patrick* (1887), *The Gaelic Marco Polo* (1898), *The Eulogy of St. Columba* (1899), and *Da Derga's Hostel* (1901).

Stokes, WILLIAM (1804-78), Irish physician, born in Dublin. He published, in 1825, *An Introduction to the Use of the Stethoscope*, and at Meath hospital became famous as a clinical lecturer. His two chief works are *A Treatise on the Diseases of the Chest* (1837) and *Diseases of the Heart and Aorta* (1854). He was one of the earliest believers in the curability of phthisis.

Stoke-upon-Trent, munic. and (with Longton and Fenton) parl. bor., Staffordshire, England, 17 m. N. of Stafford, and on the Trent and Mersey canal. It is famous as the chief centre of the porcelain and earthenware manufacture, with which the names of Wedgwood, Minton, and Copeland are associated. The Minton memorial building contains free library and museum, and schools of science and art, and in the church is a monument to Wedgwood (d. 1793). The N. Staffordshire Ry. has offices here. Pop. (1901) munic. bor., 30,458; parl. bor., 89,015.

Stolberg, CHRISTIAN, COUNT ZU (1748-1821), German poet and critic, born at Hamburg; early adopted the views of Bürger and Voss with regard to poetic style and expression, thus enrolling himself in the Göttingen school of critics. As a poet he was sweet rather than strong, and as a critic appreciative rather than analytically critical. His chief works were *Gedichte* (1779); *Gedichte aus dem Griechischen* (1782); *Schauspiele mit Chören* (1787); *Vaterländische Gedichte* (1810); also a capital translation of Sophocles in verse (1787).

Stolberg, FRIEDRICH LEOPOLD, COUNT ZU (1750-1819), German poet and translator, born at Bramstedt (Holstein), was a member of the Göttingen school of poets. Many of his poems, especially after his conversion to Roman Catholicism, were strongly tinged with religion. His chief works were *Geschichte der Religion Jesu Christ* (15 vols. 1807-18); *Gedichte* (1780); a poetic romance, *Die Insel* (1788); and excellent translations, both in prose and verse, of Plato, Æschylus, and Homer. The best edition of his *Werke* is that by Janssen (1878; 3rd ed. 1882).

Stole, a strip of silken material worn over both shoulders by priests and bishops, but over the left shoulder only by deacons, in their ministrations. The Council

of Laodicea forbade the use of the stole to the inferior orders of the clergy. Symbolically it represents the yoke of Christ. The colour of the stole may be changed in harmony with the church's seasons. Canons, and sometimes chaplains, may wear a 'tippet of black,' or scarf somewhat wider than an ordinary stole.

Stolen Goods. The owner of stolen goods is entitled to take them back wherever he finds them, provided he does not commit a breach of the peace and the goods have not been sold in market overt. Otherwise he cannot recover the goods till he has prosecuted the thief to conviction; whereupon, except in the case of a sale in market overt, the property reverts in him; but this does not apply to securities in the hands of an innocent purchaser, nor to the case of a fraudulent trustee, banker, or attorney. By the Sale of Goods Act, 1893, it is provided that, where goods are obtained by false pretences not amounting to larceny, the ownership of the goods shall not by reason *only* of the conviction revert in the original owner. By the Forfeiture Act, 1870, a felon may be ordered to pay his victim £100 compensation, and by the Criminal Law Amendment Act, 1867, an innocent purchaser from a thief may be indemnified out of the property of the thief for any loss he has suffered in consequence of a restitution order. If the stolen property has been pawned for not more than £10 outside London, or for any sum in London, the court may order its restitution to the owner with or without compensation to the pawnbroker. Magistrates may make a restitution order under their summary jurisdiction, and may order the delivery of goods in the hands of the police to the owner. Under the Larceny Advertisements Act, a person advertising a reward for stolen goods and intimating that no questions will be asked is liable to a fine of £50, but no action can be brought against a newspaper without the leave of the attorney-general. In Scotland the rule of market overt does not apply, and except in the case of money and negotiable instruments, goods must always be restored to the true owner whatever the character of the fraud by which they have been acquired. See RECEIVER OF STOLEN GOODS.

Stolp, tn., Prussia, prov. on the Stolpe, 65 m. w. of Danzig; manufactures amber goods, linen, and alcohol. Its port is Stolpmünde, 12 m. distant. Pop. (1900) 27,293.

Stomach, in man the most dilated part of the alimentary canal,

is situated in the upper and left part of the abdominal cavity, below the liver and diaphragm. Its form is irregularly conical, and its capacity in the adult is about five pints. The stomach has two openings—(1) an oesophageal or cardiac orifice, which communicates with the gullet; and (2) the pyloric orifice, which opens into the duodenum, and is guarded by the pyloric valve. The anterior surface of the stomach is in relation to the liver, the diaphragm, and the abdominal wall; while the posterior surface is in contact with the pancreas, the crura of the diaphragm, the great abdominal vessels, and the solar plexus. The organ is held in position by the omenta, which, however, permit of comparatively free movements and of expansion. The wall of the stomach consists of four coats—a serous, muscular, cellular, and mucous coat. The mucous coat of the stomach is thick, with a smooth, velvety surface, pinkish in youth, but gray or straw-coloured while at rest in the adult, but red during gastric digestion. Under a lens the surface of the mucous membrane presents a honeycomb appearance, being covered with small shallow depressions or alveoli. Throughout its entire extent the mucous membrane is covered by a single layer of narrow cylindrical epithelial cells, which are somewhat goblet-shaped and seem to secrete mucus. Numerous glands of two distinct varieties are placed vertically like rows of test tubes embedded in the mucous membrane, and open by ducts at the bottom of the alveoli. (1.) The glands at the cardiac end of the stomach are variously known as peptic, cardiac, or fundus glands. (2.) The pyloric glands occur only in the region of the pylorus, and have longer ducts and more patent lumina than have the fundus glands.

The ingestion of food stimulates the gastric glands to secretion. But the same result may be produced by other stimuli—for example, mere mechanical irritation by stones or other indigestible substances, the application of heat, and nervous stimulation, such as may be caused by the sight, smell, or thought of food; drugs have also an influence upon the gastric glands. Alcohol in moderation increases, in excess arrests, the flow. Dilute alkalis given before food, saliva, and ether all stimulate the secretion, while tannic acid and other astringents diminish it. The gastric juice is a clear, colourless fluid with a strongly acid reaction, sour taste, and characteristic odour. It consists mainly

of water, but its chief digestive constituents are hydrochloric acid and pepsin. (See DIGESTION.) The chief function of the stomach is to prepare the food for absorption by the intestine.

The commoner diseases of the stomach are catarrh, ulceration, dilatation, and cancer. All these may lead to the group of symptoms known as dyspepsia. (See DYSPEPSIA.) Acute catarrh of the stomach, caused by injudicious diet, is the most fertile cause of infantile mortality in Britain. In adults acute gastric catarrh more often follows alcoholic excess, but may result from chill, especially in tropical climates. The type of dyspepsia produced is the irritable, and the vomiting may be persistent, but the pain is not, as a rule, severe. Chronic catarrh is more associated with the torpid type of dyspepsia, and is often accompanied by dilatation of the stomach, by great emaciation, and by nervous depression. It is frequently due to chronic alcoholism, and may be merely a part of a general venous congestion caused by the portal obstruction of a cirrhotic liver. Gastric ulcer occurs with special frequency in chlorotic young women, whose poor blood and feeble circulation predispose to thrombosis of some of the small blood-vessels in the stomach wall. The area supplied by such a blocked vessel dies and is digested by the gastric juice, leaving a terraced ulcer through the mucous and submucous coats. The muscular layer may also suffer, and in some cases even the peritoneal covering sloughs, and a perforating ulcer is the result. In other cases the ulcerative process cuts across a fair-sized vessel, whose blood is poured into the stomach and vomited in alarming quantity. Perforating ulcers are generally rapidly fatal, as the contents of the stomach escape into the peritoneal cavity and set up general peritonitis. Should the ulcer not penetrate the whole thickness of the stomach wall, however, spontaneous healing is possible, especially if the diet be carefully regulated.

Dilatation of the stomach is generally secondary to chronic catarrh, or to nervous disturbance, or again to obstruction at the pylorus. The thinned and atrophied stomach is distended by fluid and gas, and the patient suffers from eructations. In spite of frequent vomiting the stomach is never thoroughly emptied, and the nutrition of the patient suffers to a marked degree.

Cancer about the cardiac end of the stomach often produces the symptoms of acute catarrh; about the pylorus it is associated with aggravated torpid dyspepsia,

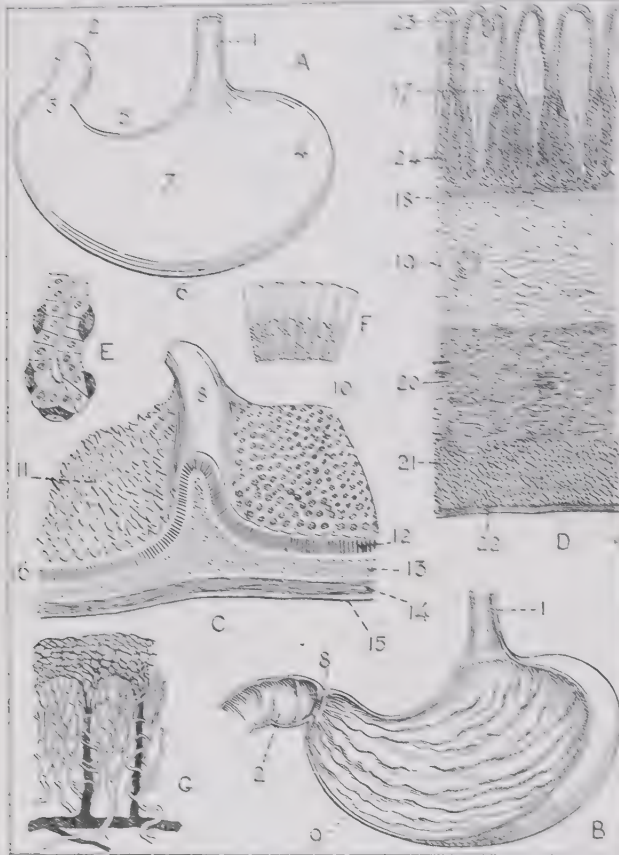
with great dilatation, and often with considerable pain. In cancer there is rarely so much hemorrhage as in gastric ulcer, and there is but little tendency to perforation, except in the case of colloid carcinoma. Sooner or later, however, the cancer patient acquires a markedly cachectic appearance, and the

time, or given only in small quantities — e.g. iced milk and beef juice in minute doses, with subnitrate of bismuth or other sedative. Counter-irritation over the stomach is useful. In irritable dyspepsias of nervous origin, however, the patient should be stuffed with food, and compelled to take extra custards and milk be-

speedy cure. In more chronic cases alcohol should be stopped or diminished, as should also astringents such as strong tea. The bowels must be kept open by enemata if necessary, and tonics should be given. When dilatation of the stomach leads to fermentation of the food, washing out the contents by means of a stomach tube is of great value. After the operation a custard should be introduced before the tube is removed. The treatment for gastric ulcer is much the same as for acute catarrh; but in nearly every case of gastric ulcer the blood requires enrichment by the administration of some form of iron. Severe hemorrhage should be checked by the application of ice to the abdomen and by ergot hypodermically. Adrenalin is also of use, and ice may be given. In cancer of the stomach great relief is often afforded by washing out the fermenting fluids.

In many of the lower animals the stomach is simple, as in man, but in some rodents it is bifid, while in ruminants it consists of four cavities. Certain plants, such as sundew or *Drosera*, secrete digestive fluids, and the leaves of pitcher plants are modified into stomach-like organs in which insects are digested. The juice of the green papaya fruit contains a ferment which forms true peptones, but is more closely related to the pancreatic ferment, trypsin, than to pepsin.

Stomach Pump. In medical practice, is a pump or syringe used to empty the stomach, or to introduce liquids into it. The pump has two apertures near the end instead of one, which constitute a sucking and a forcing passage, either of which can be connected with a flexible tube passed into the stomach, and a forcing or a sucking operation performed.



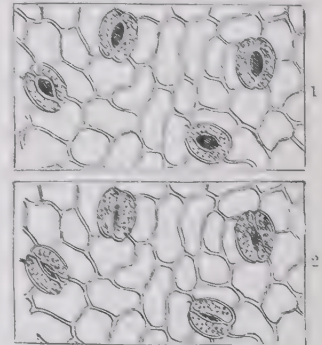
The Stomach.

A. Stomach (human). B. Same, anterior wall removed. C. Portion of stomach, pylorus and duodenum. D. Section through coats of stomach. E. Fundus of a cardiac gland. F. Epithelium from surface of stomach. G. Mucous membrane of duodenum, with villi. H. Pyloric gastric glands. I. Circular or deep muscular fibres. J. Longitudinal or external muscular fibres. K. Serous covering. L. Intestinal glands. M. Muscularis mucosae. N. Submucous coat. O. Muscular coat. P. Orifice of gland. Q. Tendons of gland.

tumour as it increases in size can often be felt on palpation through the wasted abdominal walls. It may produce obstruction at the pylorus by the formation of a hard scirrhus ring, or by the projection inwards of fungoid growths.

In acute catarrhal conditions food should be withheld for a

tween the ordinary meals. Weir-Mitchell treatment and tonics yield satisfactory results, and generally with increase in the patient's weight the symptoms disappear. In acute catarrhs arising from alcoholic excess rest and sedatives to the stomach, combined with a purge and followed by light diet, usually effect



Stomata.

1. Open, in damp weather; 2. closed, in dry weather.

Stomata, openings which occur in the outer coat or epidermis

of the green parts of plants, for the purpose of allowing an interchange of air and moisture between the plant and the atmosphere outside. They are each bounded by two 'guard-cells,' joined at each end. Usually the majority of stomata exist on the under surface of leaves, but in the case of floating leaves they are found on the upper surface.

Stone. See CALCULUS, GALL-STONES, LITHOTOMY.

Stone. See BUILDING STONE.

Stone, ARTIFICIAL. Many materials have been proposed to replace natural stone, on the ground that they are equally durable, whilst they possess the advantage of being easily moulded to any desired shape. Of these concrete is by far the most important. Ransome's stone is made by moulding a mixture of sand, chalk, and sodium silicate, and immersing the blocks in a solution of calcium chloride; the calcium silicate thus formed binds the mass firmly together. Victoria stone, used for paving, is made by soaking slabs made of powdered granite and Portland cement in sodium silicate solution.

Stone, a standard British weight, equivalent to 14 lbs. This is called the imperial stone. Other stones are also in use—16 lbs. being the stone for cheese, 32 lbs. for hemp, 24 lbs. for wool, and 8 lbs. for butcher meat.

Stone, mrkt. tn., Staffordshire, England, on Trent, 7 m. N.W. of Stafford. The church of St. Michael replaces an edifice originally connected with a 7th-century monastery. There is a boot and shoe industry. Pop. (1901) 5,680.

Stone, EDWARD JAMES (1831-97), English astronomer, was born in London. In 1860 he became chief assistant at Greenwich observatory. In 1870 he went to the Cape as astronomer-royal, and prepared the Cape Catalogue of stars, which appeared in 1880. He also made very notable observations of eclipses. In 1879 he returned to England as Radcliffe observer at Oxford, and organized several astronomical expeditions for observations in distant parts of the earth.

Stone, MARCUS (1840), English artist, son of Frank Stone, A.R.A. In 1858 he exhibited his first picture, *Rest*; was elected A.R.A. in 1877, and R.A. in 1887. Among his works are *Waterloo to Paris*, *Edward II. and his Favourite*, *A Prior Attachment*, *A Gambler's Wife*, and *The Peacemaker*.

Stone, SAMUEL (1602-63), English Puritan divine, was born in Hertford. He went to New England in 1633, and settled at Newtown (Cambridge) as teacher. In 1636 he and Hooker the preacher

migrated with the majority of the inhabitants to a settlement in Connecticut, which they called Hartford. He published *A Congregational Church a Catholic Visible Church* (1652).

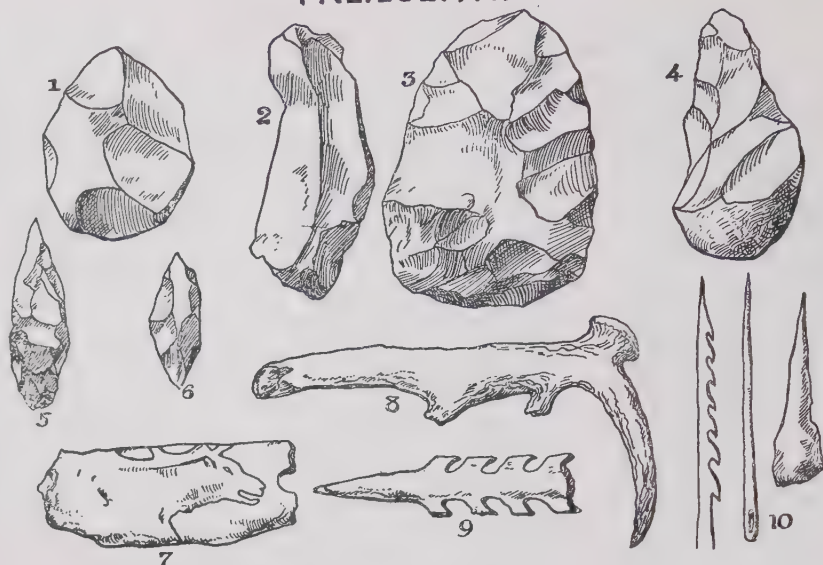
Stone Age, the term applied by archaeologists to that earliest period of man's terrene existence which is chiefly characterized by his use of tools, implements, and weapons of stone, bone, and horn. Considerable controversy still exists as to the antiquity of man. That a period existed characterized by man's use of stone implements is no new idea. Sir William Dugdale in 1660, Bishop Lyttelton in 1766, and the observations of Mahudel in 1734 all preceded the modern Danish school of antiquaries in the suggested classification of archaeological relics into the Stone, Bronze, and Iron Ages. But the Stone Age, be its origin remote or not, is divisible into two periods—the Palæolithic and the Neolithic, terms first used by Sir John Lubbock (Lord Avebury)—a classification clearly enough represented throughout the European continent. In the British Isles the Palæolithic class of implements has not hitherto been found north of the Ouse. Imperfect observation has of late years, indeed, tended towards assuming that certain stone implements found in Scotland must be Palæolithic because they are roughly chipped; but this is to forget that roughness may be due to the degradation of an art, and that unless an implement is found in closest association with the remains of the extinct fauna, we have no evidence of its being assignable to the Palæolithic division of the Stone Age.

1. *Palæolithic or early Stone Age.*—This division is itself subdivisible into the period (1) of the river-gravels, and (2) of the caves, the fauna and implements of which are not in all cases identical. (1.) Cores and nuclei (*livres-de-beurre*) of flint are among the earliest remnants of tool-making. The tools made from them are formed by chipping only, and are not ground or polished; and the materials, besides flint, are chert and quartzite. The discovery of implements of this earliest period was made in 1847, by Boucher de Perthes of Abbeville. Subsequently, similar discoveries were made at Chelles (Seine-et-Marne), St. Acheul, in Paris, in Côtes du Nord, in Poitou, and indeed over the greater part of France. In association with many of these implements the remains of three extinct species of elephant were obtained. Implements of this period have also been reported from Belgium, Italy, Spain, Por-

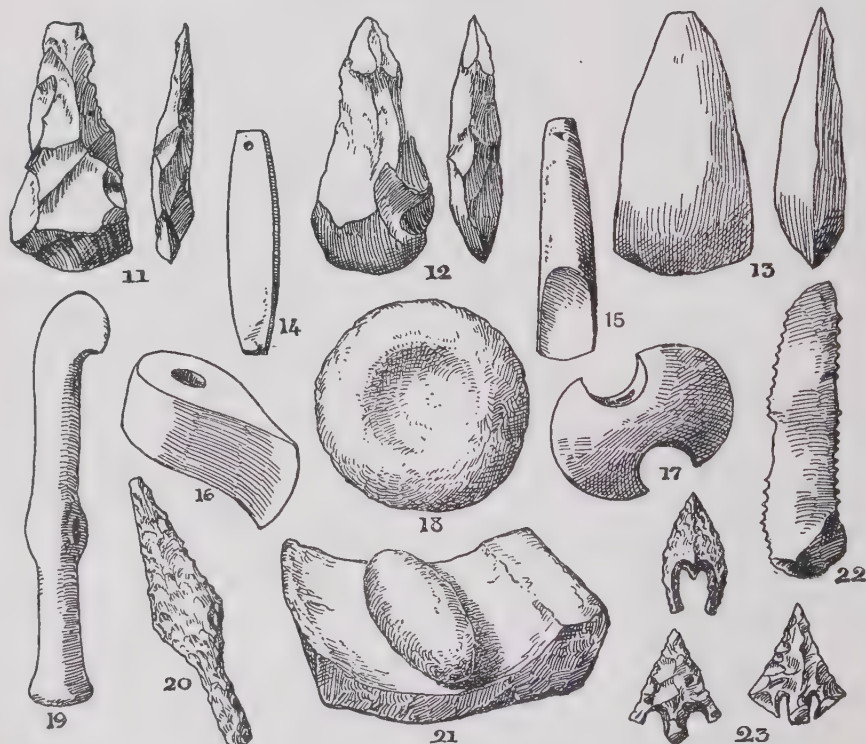
tugal, and Greece. They vary in shape from broad thick ovals to long, broad-based, and attenuated forms, and in size from two and a half inches in length to massive pointed tools ten and eleven inches in length. (2.) Cave implements. It is in France, again, that the earliest systematized results of the investigation of caverns were brought before archaeologists, the relics being chiefly obtained in Dordogne. Dr. Schmerling also, early in the 19th century, discovered in Belgium human bones, worked flints, and bone implements in association with the remains of extinct animals. Continental observers, indeed, go so far as to attempt to distinguish between a mammoth and a reindeer period, according to the remains found. The earliest of the cave implements (Le Moustier) are ovate-lanceolate in form, large subtriangular flakes worked at the edge, and rough sling-stones; and there is an almost entire absence of implements of bone. Next (Solutrén) come lance-heads and daggers, arrow-heads of two forms, knife-like flakes, scrapers and borers—all of flint. In bone or reindeer-horn these early people made lance-heads, a very few of which are engraved with figures of animals. Thirdly (La Madeleine), well-shaped flint flakes, scrapers, pebbles used as mortars, rounded hammer-stones, are all fairly abundant; a few flint saws have been found; while in bone and horn there are dart-heads, harpoon-heads, and small perforated needles. The art of the period is marked by the frequency of incised figures of animals (very rarely of the human figure) done upon stone, bone, horn, and ivory, and by ornaments formed of pierced bones and teeth. Fish-bones and bird-bones are abundant. In Britain, objects of human manufacture have been found in association with more than twenty extinct species, including the lemming (*Mus lemmus*), the hyæna (*H. crocuta*), the sabre-toothed tiger (*Machairodus latidens*), the cave lion (*Felis leo*), the Irish elk, the mammoth (*E. primigenius*), and the hippopotamus. Nevertheless, as Sir John Evans insists, 'the occupation of caves by man is not confined to any definite period, and even in the case of the discovery of objects of human workmanship in direct association with the remains of the Pleistocene extinct mammals, their contemporaneity cannot be proved without careful observation of the circumstances under which they occur, even if then.'

2. *Neolithic or later Stone Age.*—The principal larger implements characterizing this period

PALÆOLITHIC



NEOLITHIC



Implements of the Stone Age.

Palæolithic:—1. Earliest form of flint implement. 2-4. Typical Palæolithic flint implements. 5. Flint spear-head. 6. Flint arrow-head. 7. Bone engraved with figure of deer. 8-10. Implements of horn and bone. **Neolithic:**—11. Implement chipped only. 12. Implement with working edge ground. 13. Implement ground and polished. 14. Hone. 15. Gouge. 16, 17. Polished axe-heads. 18. Hand-hammer. 19. Axe-hammer. 20. Spear-head. 21. Saddle quern. 22. Saw. 23. Arrow-head. (Drawn from examples in British Museum.)

are axe-heads, of an endless variety of form and size, but in nearly every instance polished and ground to a perfect cutting edge; chisels, of polished flint and other very hard stones; axe-hammers, of a great variety of sizes and shapes, perforated for a wooden shaft; hammer-stones, plain and with cup-shaped depressions; circularly-chipped thick discs of quartzitic stones, almost exclusively confined to the shores of the Moray Firth in Scotland; saddle-querns and hand-mills; grinding and whet stones. Smaller implements are spear-heads, arrow-heads, fabricators, knives, and serapers, made of flint and chert, obsidian, quartzites, and other hard materials. Saws of flint occur in great abundance on the sands of Glenluce (Scotland); and quite recently a minute type of flint implement, less than one inch in length and frequently not one-twelfth in breadth, exquisitely worked all round the edges, has been noticed, principally by the Rev. Reginald A. Gatty in Yorkshire and by other collectors in France, Egypt, Belgium, India, and in Scotland. Beautifully trimmed curved daggers of flint are a feature in the Neolithic relics of Denmark. Ornaments of jet or lignite, such as buttons and rings bearing decoration, necklaces, armlets, pendants, and beads show that early man displayed a taste for dress and personal adornment. See Sir J. Evans's *Ancient Stone Implements of Great Britain* (1897); Lord Avebury's [Lubbock] *Prehistoric Times* (ed. 1900); Dawkins's *Early Man in Britain* (1880).



Stone-chat.

Stone-chat (*Pratincola rubicola*), one of the chats which are resident within the British area. The bird reaches a length of about five inches, and has the head and throat black, the back black with brown markings, the breast rufous, the sides of the neck white, and a distinct white patch on the wing. The nest is placed among herbage on the ground, and the eggs number from

five to six. The food consists chiefly of worms, insect larvæ, and beetles, with some seeds.

Stone Circles, as understood by modern archaeologists, means a circular area enclosed by free-standing, pillar-like stones. But the term has been applied (1) to many different and more or less circular arrangements of stones, whether the stones were merely contiguous (as in the boundary of a cairn) or formed the ruined portion of a wall, such as that of a broch; and (2) to numerous arrangements of small stones in India, France, and Ireland. There is now, however, no doubt that the stone circle properly so called has its archaeological home in Great Britain, and further, that in Scotland we find the area of its fullest development. See CIRCLES OF STONE.

Stone Coal. See ANTHRACITE.

Stone-crop, the popular name for plants of the genus *Sedum*, order Crassulaceæ. See SEDUM.

Stone-fly, a name given by anglers to the species of the genus *Perla*, which are neuropterous insects belonging to the family Perlidæ. A common species is *P. marginata*, a yellowish-brown insect, somewhat mothlike in flight, and of sluggish habits. It is found in the vicinity of water, in which the eggs are deposited, and where the young pass their larval life.

Stone-fruit. See FRUIT.

Stoneham, tn., Middlesex co., Massachusetts, U.S.A., 10 m. N. of Boston; has manufactures of boots, leather, and automobiles. Till 1725 it was called Charleston End. Pop. (1900) 6,197.

Stonehaven (locally STONEHIVE), police bor., seaside resort, and cap. of Kincardineshire, Scotland, on bay of same name, 16 m. by rail s.s.w. of Aberdeen; is a herring-fishing centre. The old town is connected with the new town by a bridge over the Carron. Tanning and distilling are carried on. The ruins of Dunnottar Castle are about 2 m. S. Pop. (1901) 4,577.

Stonehenge, Wiltshire, England. This unique megalithic structure has been the subject, for seven hundred years, of the wildest theories. The earliest yet discovered notice of it is by Henry of Huntingdon (d. 1154). The theories regarding its origin include the following:—That here was the burial-place of Boadicea; that it was the Giants' Dance removed by Merlin from Ireland and rebuilt on Salisbury Plain; Dr. Charlton, physician to Charles II., deemed it Danish; Inigo Jones, who made a plan of it for James I., set it down as Roman; John Aubrey, the originator of the Druidic theory, made plans in 1666, and of course claimed it as a Druid temple;

Stukeley in 1740 started the theory that it was part of a vast opiate monument; and other theories were propounded by Andrew Borde (1542), John Hardyng (1543), Leland (1552), John Speed (1627), John Stow (1631), and Thomas Fuller (1656). The oldest known drawing of it occurs in a MS. of the *Scala Mundi* (c. 1340) in the college of Corpus Christi at Cambridge.

Stonehenge consists of a triply concentric group of stones arranged nearly in a circle, and within the circumference of a deep trench, the diameter of which is 333 ft. The outermost circle of megaliths has a diameter of 100 ft., the middle of 75 ft., and the innermost of 40 ft. The outermost circle consisted (when complete) of probably thirty great upright stones, each about 12 ft. high, 6 ft. broad, and over 3 ft. thick. Every couple was covered by a great oblong block, fastened on mortise-and-tenon principle, these stones being 10 ft. long. In the middle circle the stones, only seven of which now remain, are of diabase, a mineral of a very different composition from the sarsens of the outer ring. The innermost circle is composed of diabase, and, like the middle circle, of much smaller blocks. There may have been twenty-two, and opinions differ as to whether they are of the same date as the rest of the structure. The outstanding feature of Stonehenge, however, is the presence, between these two inner circles of comparatively small stones, of a horseshoe-shaped group of sarsen stones of transcendent magnitude. One couple with its lintel occupies a space on the south-west (the middle of the 'horseshoe' curve), and four others complete the arrangement. Two of the uprights of these great trilithons stand over 22 ft. above ground, and the other three are 16 ft. and over. The lintels measure about 15 ft. In front of the south-west trilithon, and well inside the circle, lies a vast stone 18 ft. long, and over 4 ft. wide, called 'the altar.' On the northeast is a great stone called 'the Friar's Heel,' standing outside of the circle. Partial excavation conducted in 1901 resulted in the discovery of a few flint implements, stone hammers, and a sort of pounder-chisel, which seems to have been the tool used in 'dressing' the stones. No pottery was discovered by which alone it would be possible to assign the date either to the new Stone Age or the Bronze Age. It may be mentioned, however, that experts in astronomy, founding on the assumption that Stonehenge was a 'sun-temple,' have arrived at the date 1680 B.C. — a date pretty

closely corresponding with the period of the Bronze Age in Britain. See Sir H. James's *Stonehenge and its Barrows* (1867); Long, in *Wiltshire Magazine* for 1876; *Archæologia*, vol. lviii, pt. 1; and Flinders Petrie's *Stonehenge* (1881).

Stonehenge, pseudonym of JOHN HENRY WALSH (1810-88), English writer on sport, born at Hackney; practised as a surgeon at Worcester until 1852, when he removed to London. From 1857 he was editor of *The Field*. He was one of the founders of the National Coursing Club and of the All-England Tennis Club. Among his works are *The Greyhound* (1853), *British Rural Sports* (1856), *The Dog in Health and Disease* (1859), *The Shot-gun and Sporting Rifle* (1859), *The Horse* (1861), *Dogs of the British Islands* (1867), and *The Modern Sportsman's Gun and Rifle* (1882-4).

Stone River, riv., Tennessee, U.S.A., on both sides of which,

shops, engineering works, and cotton, woollen, and silk factories. Pop. (1900) 8,540.

Stonyhurst, Roman Catholic college, Lancashire, England, 5 m. N.W. of Whalley station (L. & Y.R.). The buildings are chiefly modern, added to an Elizabethan mansion. The library (30,000 vols.) contains some rare treasures, including an uncial Latin MS. (7th century) of St. John's Gospel, found in the tomb of St. Cuthbert; an illuminated MS. of Froissart's *Chronicles*, vol. i. (the companion volume is in the British Museum); a Prayer Book which belonged to Mary Queen of Scots; a large number of illuminated MSS. of the 14th and 15th centuries; and a large collection of historical MSS. relating to Catholic affairs in the 16th, 17th, and 18th centuries. In the ornamental grounds is an observatory. There are about 300 students.

Stony Stratford, mrkt. tn.,

or two Sundays, but for major ones several days. In earlier times it was customary to add a public rebuke from the pulpit; but this fell into desuetude, though the 'stool' was kept up till the early part of the 19th century, and the rebuke was given within the privacy of the session until very recent days.

Stopford, SIR ROBERT (1768-1847), British admiral, took part in Rodney's action off the Saintes, in Lord Howe's battle of the 'glorious first of June,' 1794, in the battle of San Domingo in 1806, and in the expedition to Copenhagen in 1807. On Feb. 24, 1809, he destroyed three French frigates at Sables d'Olonne. Later in that year he was Gambier's second in command at the time of Cochrane's attack upon the French in Basque Road. In 1810 he became commander-in-chief at the Cape of Good Hope, and, proceeding on his own initiative to the E. Indies, effected the capture of



Stonehenge.

[Photo by Valentine.]

and particularly at Murfreesboro, near the r. bk., there were engagements between the Federals under Rosecrans and the Confederates under Bragg, between Dec. 31, 1862, and Jan. 2, 1863.

Stones, PRECIOUS. See GEMS AND PRECIOUS STONES.

Stonewall Jackson. See JACKSON, THOMAS J.

Stoneware, a crude kind of porcelain, of which the materials, mainly flint and felspar, are of coarser quality, and have not been so strongly heated and nearly fused in the process of manufacture. Stoneware is unlike porcelain in being opaque, and differs from earthenware in not being porous. It is, however, usually glazed by throwing salt into the furnace, the sodium of the salt forming a kind of glass with the silica of the ware. See POTTERY.

Stonington, summer resort, New London co., Connecticut, U.S.A., Long Island Sound, 43 m. S.W. of Providence, has a good harbour. There are railway work-

Bucks, England, 8 m. N.E. of Buckingham. There are two ancient church towers, and a boys' orphanage. Pop. (1901) 2,353.

Stool-ball, a popular English game of the 15th to the 18th century, consisted in a stool being placed on the ground, before which one of the players took his place, while his antagonist, standing at a distance, threw the ball at the stool. The aim of the latter was to strike the stool, while that of the former was to prevent him from doing so. See Strutt's *Sports and Pastimes of the People of England* (1903).

Stool of Repentance, a seat or pew in the parish churches of Scotland, in which those sentenced to expiate such sins as immorality, lying, evil-speaking, drunkenness, and the like had to appear and remain during service. The offender was clothed in a long robe of sack, or was wrapped in a white sheet, and thus appraised was required to stand, for minor offences one

Java in 1811. He became a full admiral in 1825. In 1840 he conducted the operations against Mehemet Ali on the coast of Syria, including the bombardment and capture of S. Jean d'Acre. Upon his return to England (1841) he was appointed governor of Greenwich Hospital.

Stop-order. When a person entitled to or interested in funds in court has mortgaged or sold his interest to third parties, they may obtain a stop-order preventing any dealing with the funds without notice to them.

Stoppage in transitu. Under the Sale of Goods Act, 1893, when the purchaser of goods becomes insolvent, the seller has the right to stop any goods while on their way to the buyer, and to retain them till paid for. The stoppage is effected either by actual resumption of possession, or by giving notice to the carrier. The right to stop goods *in transitu* is lost if a document of title has been given by the seller to the

buyer, and by him transferred to a *bonâ-fide* purchaser. The stoppage does not generally rescind the contract, but in certain cases the rights of the parties are modified.

Storage Batteries. See ACCUMULATORS.

Storax, a balsam obtained by boiling the inner bark of *Liquidambar orientalis*, a tree growing in Asia Minor. It forms a brownish-yellow syrupy liquid, with an aromatic odour and taste. It is used to a small extent in medicine—externally for destroying parasites, and internally as an expectorant and mucous disinfectant.

Stores. In technical military language 'supplies' means food, forage, fuel, lighting materials, straw, etc., and the issue and administration of these things is the business of the Army Service Corps, under the quartermaster-general at the War Office. All other articles required for the use of the army are 'stores.' There are a few exceptional categories of stores which are provided by special agencies. These are (1) certain articles used in construction by the Royal Engineers, (2) artillery stores, (3) surgical and (4) veterinary appliances and medicines, and (5) stationery. All other stores are administered by the quartermaster-general, and under him by the Army Ordnance Department. Stores are broadly divided into warlike stores and general stores. The War Office supplies the navy as well as the army with the former class of stores.

Stores, CO-OPERATIVE. See CO-OPERATION.

Storey, GEORGE ADOLPHUS (1834), English artist, born in London. His first picture was exhibited in 1852, and ten years later he went to Spain, and was engaged in painting portraits at Madrid. He was elected A.R.A. in 1876. He is a painter of portraits, and among his best-known pictures are *The Meeting of William Seymour with Lady Arabella Stuart*, *A Royal Challenge*, *The Connoisseur*, and *Venus lamenting the Death of Adonis*. He published a book on *Meisssonery* (1886), and *Sketches from Memory* (1899).

Storing Fruit. The storeroom for apples and pears should be cool, though frost-proof; slightly moist, and well ventilated, though free from draughts. Apples should not be in contact with each other. If they are very choice, it is wise to wrap each apple separately in tissue paper. The fruit should be hand-picked and placed in the storeroom when quite dry, and any specimens that show signs of rotteness should be instantly removed. Some provision for air

(air-bricks), or an aperture covered outside and inside with perforated zinc, should be provided in the room just above the ground-line. Pitch, tar, or cold creosote should cover the lower plates and all the woodwork up to two feet from the ground to protect from damp. It should be cased in thatch, which may be eighteen inches thick on the roof and six inches at the sides. Reed is the most lasting, but it may be of wheat straw or heather. Both an inside and an outside door should be provided. Windows of 21-oz. glass are inserted—this saves the use of a candle at storing time; but outside shutters must be provided to keep the place as dark as possible, and a fruit-house is perhaps better without windows. Ventilation is provided by an

best possible floor is the natural earth; paved surfaces are apt to become too dry. For pears the fruit-house should be rather drier and rather warmer than for apples. In either case the winter temperature should not fall below 40° F., and the summer temperature should not rise above 60° F. A very convenient method of storing apples and pears is in flat trays, in which the fruit is placed direct as picked from the tree. Medlars should be picked in November, after the frost has touched them. Their stalks should be dipped in strong lime, and the fruits buried in boxes of wet bran, no two medlars touching, and placed in the fruit-house. Walnuts should be removed from their outer rinds, and at once placed in an earthen jar. Cover them with three inches of sawdust and place them in a cool cellar or fruit-house. Filberts, cobs, and hedge-nuts, for storing, should be gathered just before they slip their husks, though they must be so ripe as to do so very readily. They should be dried before storing, or the husks will become mouldy. They may then be treated as walnuts, or they may be placed in a jar and sprinkled over with salt.

Stork, or WHITE STORK (*Ciconia alba*), a large bird which is distributed over the greater part of Europe, although it is only an occasional visitor to the British Isles. It also extends into Asia, and winters in Africa. On parts of the Continent, especially in Germany and Holland, the stork is protected and encouraged to breed. In France, where it is much persecuted, it is rare, as it is also in Italy. Particular storks return in April to the nesting-place of the previous season, the nest often being constructed on the top of a cart-wheel, placed on the roof of a building. The food consists of frogs, reptiles, small fish, small mammals, young birds, worms, and insects. During the breeding season the birds keep up a curious clatter with their bills. They are the subject of many myths and legends among the Germans. The white stork has a length of over forty inches. The plumage is white, except for the wing-coverts and quills, which are black. The beak, legs, and feet are red, the claws being brown. The black stork (*C. nigra*), which is black above and white below, is an occasional visitor to Britain. Storks, in the wide sense, are members of the family Ciconiidae, and are characterized by the long neck and long stout beak, which is usually straight, and has nostrils which are mere perforations of the horny sheath. The legs are long, the tibia being partly



White Stork.

opening under the apex of the roof at each end (18 in.), a small opening being left between the dairy shutters, which can be stopped by hay or moss in severe weather, and the inside opening should be protected by perforated zinc, fine enough to keep out wasps and flies; another ventilator should be inserted about midway under the lowest shelf, to open from outside by a shutter, and to be covered inside by perforated zinc. To protect the contents from rats, a half-inch stout wire netting should be fastened to the matchboard outside beneath the thatch. The shelves should be made of three-quarter-inch matchboard, should not quite meet each other by a quarter of an inch, so as to gain a slight circulation of air; upon this place clean wheat straw, so that the fruit does not touch the shelves. The

bare; the toes are short, the three front ones being partially webbed, while the wings are large and fairly long. In addition to the storks proper, the family includes the adjutant, jabiru, wood-ibis, and so on.

Storm, a disturbance of the atmosphere in which the wind attains a velocity of forty miles an hour or upwards. In some regions, such as Kerguelen Island in the S. Indian Ocean, the wind blows with the strength of a gale, with but little interruption, all the year round. Our knowledge of storms has been much facilitated of late years by the study of charts, in which the barometric pressure and wind direction of the disturbance can be followed day by day. In European storms the area is almost invariably either circular or elliptical, and the disturbance is seldom less than 600 miles in diameter, but more frequently from 1,200 to 2,000 miles across. The usual direction in which European storms advance is from south-west to north-east, while very few travel towards some westerly point. The rate of advance averages about twenty miles per hour, on rare occasions reaching forty miles or more. Occasionally the storm-centre remains stationary, and may even alter its course and recurve in a line closely following its former track. Storms are usually heralded by the appearance of cirrus clouds and halos around the sun or moon. Thunderstorms are not uncommon accompaniments of winter storms in the more northern parts of the British Isles. The temperature in front of a winter storm is usually high for the season, and the air feels muggy and close; but after the centre is reached and the barometer begins to rise, the thermometer falls quickly under the influence of a west or north-west wind. The wind in a storm in the northern hemisphere flows spirally inwards towards the centre, in conformity with Buys-Ballot's Law. See R. H. Scott's *Weather Charts and Storm Warnings* (3rd ed. 1887); Abercromby's *Weather*, in Int. Scientific Series, vol. lix. (1887). See also METEOROLOGY, ATMOSPHERE, THUNDER, LIGHTNING, etc.

Storm, GUSTAV (1845-1903), Norwegian philologist; won in 1872 the gold medal of the Danish Academy of Sciences by his treatise on Snorri Sturluson's history, and was appointed (1877) professor of history at Christiania University. He edited the works of P. A. Munch (1872-86), *Monumenta Historica Norvegia* (1880), and, with modern translation, *Snorre Sturlassons Kongesagaer* (1896), and wrote *Kritiske Bidrag til Vikingetidens Historie*

(1878) and *Studier over Vinlands-rejserne* (1888).

Storm, THEODOR WALDSEN (1817-88), German novelist and poet, born at Husum, Schleswig; spent his life as a judge in his native province and in Prussia. His works, which were immensely popular in their day, include *Gedichte* (1852), and short stories published in book form under such titles as *Imensee* (1852), *Zerstreute Kapitel* (1873), *Aquis Submersus* (1877), *Psyche* (1877), *Carsten Curator* (1878), *Hans und Heinz Kirch* (1883), *John Riev* (1886), *Der Schimmelbreiter* (1888). *Lives of Storm* have been written by Schütze (1887) and Wehl (1888).

Stormonth-Darling, MOIR TOD STORMONTH-DARLING, LORD (1844), judge of the Scottish Court of Session, was born in Edinburgh; became an advocate (1867), and was M.P. for Edinburgh and St. Andrews Universities and solicitor-general for Scotland from 1888 to 1890, when he was appointed a judge. He has written verses which appeared in *Ballads of the Bench and Bar* (1882).

Storm Warnings. See WEATHER FORECAST.

Stornoway, bur. of barony, police bur., and seapt., isl. of Lewis, Ross-shire, Scotland, 180 m. N.W. of Oban; is the chief town in the Western Isles, and has the Nicolson Institute, a castle, and is a herring-fishing station. See William Black's *Princess of Thule*. Pop. (1901) 3,852 (about 10,000 in the fishing season).

Storthing, the Norwegian Parliament, consisting of representatives elected triennially and holding annual sessions. It is divided into an upper house (Lagthing) and a lower house (Odelthing), one-fourth of the members being chosen to sit in the former and the remainder in the latter.

Story, MADAME EMMA EAMES. See EAMES.

Story, JOSEPH (1779-1845), American jurist, born at Marblehead, Massachusetts; was admitted to the bar (1801), and was appointed associate justice of the Supreme Court of the United States (1811), a post he filled for thirty-four years, and in which he achieved both a European and an American reputation as a jurist. He was also Dane professor of law in Harvard from 1829 until his death. Among his works are *Commentaries on the Constitution of the United States* (1833), *Commentaries on the Conflict of Laws* (1834), *Commentaries on Equity Jurisprudence* (1836), *Commentaries on the Law of Agency* (1839), and *Commentaries on the Law of Bills of Exchange* (1843). See W. W. Story's *Life and Letters of Joseph Story* (1851).

Story, ROBERT HERBERT (1835), Scottish theologian, born at Rosneath, Argyllshire. He was appointed minister of St. Andrew's Church, Montreal (1859), succeeded his father in the charge of Rosneath (1860), and was elected professor of ecclesiastical history in Glasgow University (1886), and principal (1898). He has been one of the royal chaplains since 1886, and in 1894 Moderator of the Assembly. Among his writings are *Robert Story of Rosneath* (1862), *Christ the Consoler* (1868), *Robert Lee* (1868), *William Carstairs* (1870), *Creed and Conduct* (1872), *Heath Haunts of the Riviera* (1880), and *The Apostolic Ministry in the Scottish Church* (1897).

Story, WILLIAM WETMORE (1819-95), American sculptor, poet, and author, born in Salem, Massachusetts, was son of Chief-justice Story. He went to Europe to study sculpture, his first successes being statues of *Cleopatra* and the *Libyan Sibyl* in the London exhibition of 1862. He also executed the *Peabody* statue in front of the London Royal Exchange. He wrote *Roba di Roma* (1862), *Graffiti d'Italia* (1869), *The Roman Lawyer in Jerusalem* (1870), *Nero* (1875), *Castle St. Angelo* (1877), *Vallombrosa* (1881), *He and She* (1883), *Fiammetta* (1885), *Poems* (1885), and a *Life of his father* (1851). See H. James's *W. W. Story and his Friends* (1903).

Stothard, THOMAS (1755-1834), English painter and illustrator, was born in London. His first work as an illustrator appeared in *Bell's Poets* and in the *Novelist's Magazine*. The number of his designs for illustrations was enormous—Mrs. Bray puts it at 10,000, and of these 3,000 were engraved. The designs for *Clarissa Harlowe* and *Tristram Shandy* are perhaps his finest work. Shakespeare, *Pilgrim's Progress*, *Robinson Crusoe*, and Rogers's *Italy* contain his most mature designs. His paintings, though pure in colour and skilful in composition, lack originality; but his *Canterbury Pilgrims* (1806) has always been very popular. He was made an R.A. in 1794, and librarian to the Academy in 1812. See Mrs. Bray's *Life of Thomas Stothard* (1851).

Stoughton, JOHN (1807-97), English ecclesiastical historian, was an independent minister; he was ordained in 1833, and after ten years' service at Windsor was called to Hornton Street Church, Kensington, which he occupied till 1872, when he was elected to the chair of historical theology at New College. His chief works were *Church and State Two Hundred Years Ago* (1862); *Ecclesiastical History of England* (1867-

70); *Religion in England under Queen Anne and the Georges* (1878); *Religion in England, 1800-1880* (1884). See his *Recollections of a Long Life* (1894).

Stour, riv., England, rises in Cambridgeshire, flows generally s. to the border of Essex, where it turns E., separating that county from Suffolk. It is navigable to Sudbury. Length about 50 m.

Stourbridge, tn., Worcestershire, England, on border of Staffordshire, 5 m. s. of Dudley, and on the Stour. The church of St. Mary dates from the 14th century. Glass manufacture was established by French and Hungarian refugees about the middle of the 15th century. Other industries include iron and chain works, and the manufacture of parchment, skin rugs, and fire-cloth goods. Pop. (1901) 16,302.

Stourbridge Fair. See FAIR. **Stourport**, tn., Worcestershire, England, 4 m. s.w. of Kidderminster, at confluence of Stour with Severn, and on Worcester and Stafford canal. The principal industries are ironfoundry, carpet-weaving, vinegar-brewing, and tin-stamping. Pop. (1901) 3,111.

Stout, an alcoholic beverage brewed from a grist of ordinary and burnt malt, or these with the addition of caramel and malt substitutes. The many different grades are obtained by varying the grist, hops, and temperatures of mashing and sparging. (See BREWING.) As with ale and beer, the chief constituents of the finished product are carbohydrates, alcohol, water, organic acids, and soluble nitrogenous compounds. The alcohol varies from 4 to 75 per cent., the extract from 5 to 85 per cent., and the acidity from 0.30 to 1.29 per cent. Many brewers send out a speciality such as invalid, dandelion, oatmeal, or other variety.

Stove. See HEATING.

Stovehouse and Stove Plants. A stovehouse is a glasshouse used for the cultivation of plants which require a high temperature. The most suitable form is the span-roof, the next most suitable a half-span. The heat is usually obtained by means of hot-water pipes, occasionally supplemented by a central pit of fermenting leaves. The stovehouse should not be too high. Considerable light is essential, or the plants will tend to become spindly, and the leaves will not take on their full colour. Air should be carefully admitted in the neighbourhood of the hot-water pipes, but precautions must be taken that no draught plays on the plants. The stages for the plants are best made of slate. Abundance of water is needed by

most stove plants, and therefore adequate drainage must be afforded. The walls, glass, pots, and benches must be kept thoroughly free from all dirt, especially from decaying organic matter. The most generally useful soil for stove plants is a mixture of sand and peat, with an equivalent amount of fibrous loam; but certain plants require special treatment in this respect. Among the desirable fine-leaved plants for the stove are Crotons, Caladiums, Alocasias, Dracaenas, and Marantas. It is, however, the winter-flowering plants which are likely to be more and more valued in the future, such as Amaryllis, Begonias, *Plumbago rosea*, *Imantophyllum*, *Centropogon lucyanum*, *Pentas carnea*, *Eucharis amazonica*, *Epiphyllums*, *Gardenias*, *Gloxinias*, *Gesnerias*, and *Franciscea calycina major*. Roof climbers considerably help the general effect, but they must be prevented from growing too densely or light will be unduly excluded; desirable climbers are the scarlet passion flower (*Passiflora princeps*), *Stephanotis floribunda*, *Jasminum gracillimum*, *Thunbergia Harrisii*, *Perularia odoratissima*, and the Allamandas. Handsome foliage may be had by planting *Cissus discolor* or *C. porphyrophylla*. Where the stove is a lean-to, the back wall should be covered with creeping plants, planted out in a narrow border. The night-blooming Cereus (*C. grandiflora*) flowers well when trained near the glass on the back wall of a stove. *Bougainvillea glabra* flowers well at the top, or, if in a very light house, as low down as the wood ripens. *Rondeletia speciosa major* makes a good wall-plant. The Hibiscus, in several forms, will cover a large space in a comparatively short time; the variegated variety, *H. Cooperi*, is a rapid grower when once fairly established, and has a chaste appearance; its large, single, crimson flowers, too, are showy. One or two of the Ficuses, such as *F. barbata* and *F. repens*, may be used to cover dark corners, and a very useful amount of bright colour, as well as blooms for cutting, may be obtained by planting *Euphorbia fulgens* in a warm house in a light, rich border.

Stow, vil. and par., Midlothian, Scotland, 24 m. s.s.e. of Edinburgh. The place is of great antiquity, and from it, under the name of 'Stow of Wedale,' are dated many old charters of the bishops of St. Andrews. Pop. (1901) 557.

Stow, JOHN (?1525-1605), English chronicler and antiquary, was born in London. He was a tailor till near his death. His chief works are *Summarie of*

Englishe Chronicles (1565), *Annales of England* (1573), and the *Survey of London* (1598). Several editions of each, bringing the histories up to date, were issued during his lifetime. See *Life* by Strype prefixed to his *Works* (1720).

Stowe, HARRIET BEECHER. See BEECHER.

Stowell, LORD. See SCOTT, WILLIAM.

Stowmarket, mrkt. tn., Suffolk, England, 12 m. n.w. of Ipswich. The church of SS. Peter and Mary is ancient, but has undergone some restoration. The old vicarage house dates from the Tudor period. Agricultural implements, gun-cotton and cordite, and automobiles are manufactured. Pop. (1901) of civ. par. 4,162.

Strabane, mrkt. tn., Co. Tyrone, Ireland, 12 m. s. of Londonderry, with market gardens and orchards. Quarterly fairs are held. Shirt-making is an important industry. Pop. (1901) 5,033.

Strabismus, or SQUINT, an ocular defect produced by deviation of the visual axis of one or other eye from the normal direction for conjugate or binocular vision. Convergent strabismus is almost always associated with hypermetropia; divergent with myopia, though occasionally the converse is the case. In paralytic squints the affected eye cannot follow the moving finger, but lags behind its fellow or remains fixed. Paralytic squint is often associated with ptosis, and with double vision and ocular vertigo. To prevent squint, errors of refraction in children should be corrected by appropriate glasses, and all strain of the eyes must be prevented. When strabismus already exists, operation and adjustment of the muscles may be necessary. To relieve ocular vertigo and double vision the false image may be eliminated by placing an opaque glass over the defective eye. Prismatic glasses of suitable strength are also useful in some cases. Operative interference in paralytic strabismus should be resorted to only after a prolonged trial of constitutional and local measures has failed. See MYOPIA and VISION.

Strabo (c. 55 B.C.-25 A.D.), ancient Greek geographer, was a native of Amasia in Pontus, Asia Minor. He visited all the countries between Armenia on the east, Italy on the west, the Euxine on the north, and Ethiopia on the south. His geography includes a good deal of history, but exhibits an excessive reliance on Homer and an inadequate use of mathematics and astronomy. There are editions by Meineke (1866), with Latin trans.; Müller and

Dübner (1857). Eng. trans. by Hamilton (1887); selections by Tozer (1893).

Strachey, SIR JOHN (1823), Indian administrator, born in London; entered the Bengal civil service (1842), became judicial commissioner of the Central Provinces (1862), chief commissioner of Oudh (1866), acting viceroy and governor-general of India on the assassination of Lord Mayo (1872), and lieutenant-governor of the North-West Provinces (1874). He is joint-author of *The Finances and Public Works of India* (1882), and wrote *Hastings and the Rohilla War* (1892), and *India: Its Administration and Progress* (3rd ed. 1903).

Strachey, SIR RICHARD (1817), British general, born at Sutton Court; served in the Sutlej campaign (1845-6), was secretary to the government of the Central Provinces (1857-8), employed in the public works department (1858-65), inspector-general of irrigation (1867-71), and member of the Council of India (1875-89). His services with regard to Indian finance were of great value. He wrote *The Finances and Public Works of India* (in conjunction with his brother, Sir John Strachey, 1882), and *Lectures on Geography* (1888).

Stradella, ALESSANDRO (17th century), Italian composer, whose career has been the subject of much controversy, but about whom little is definitely known beyond the fact that he belonged to the Venetian school and ranked high amongst his contemporaries. The greater number of his compositions, consisting of oratorios, operas, cantatas, and madrigals, are still in manuscript, and the celebrated air, *Pietà, Signore!* for some time attributed to him, is now believed to have been the work of another composer.

Stradivari, ANTONIO (1644-1737), the greatest representative of the Cremonese school of violin-making, was born at Cremona. He was a pupil of Nicholas Amati, and his instruments, especially those of the grand period (1700 to about 1725), are still unrivalled, whether as regards tone-producing qualities, elegance of form, or beauty of workmanship. He sold his violins for about £4 each, but scarcely any of his grand period instruments are now obtainable for less than £1,000. (See **VIO-LIN**.) One of his violins recently realized £3,000, and a 'cello £4,000. See Petherick's *Antonio Stradivari* (1900).

Strafford, THOMAS WENTWORTH, FIRST EARL OF (1593-1641), British statesman, born in London. He entered Parliament as member for Yorkshire in 1614

and 1621, and set himself against the pretensions of the king and against the administration of Buckingham. Having in 1627 refused to pay his quota of a forced loan, he was imprisoned for a short time. In Charles's third Parliament Wentworth at first stood out as what may be termed the leader of the House of Commons; but when the king refused to listen to the remonstrances of the Commons, Wentworth abdicated his leadership, and had no hand in drawing up the Petition of Right. Late in that year he made what has been termed his apostasy, being created Baron Wentworth, and appointed president of the council of the north. His position was that, having to choose between prerogative and the rights of the subject, he chose prerogative; and it is as the instrument of absolutism that he is known. In 1633 he was appointed lord-deputy of Ireland (lord-lieutenant, 1640), and in Ireland began to apply the system which in his letters to Laud he calls 'thorough.' He reformed abuses of administration, and endeavoured to settle Connaught as Ulster had been settled. When the king was in trouble over ship-money in England, and over Laud's service-book in Scotland, Wentworth urged resistance to popular demand. In 1640 he was created Baron Raby and Earl of Strafford. He then advocated the use of the Irish army against the Scots, but as his enemies declared, against English liberties. When the Long Parliament met in 1640, its first work was to investigate the grievances of Wentworth's Irish enemies, and under the leadership of Pym it was determined to impeach him of high treason. Strafford struggled hard for his life, but Charles, on May 10, 1641, gave his consent to the Bill of Attainder. Strafford was executed on Tower Hill. See *Lives* by E. Cooper (1866) and J. Foster (1836).

Strahan, tn. and seapt., Tasmania, Australia, on Macquarie Harbour, on w. coast. Pop. (1901) 1,504.

Strahlegg Pass, Alpine glacier pass (10,995 ft.) in Bernese Oberland, leads from Grindelwald to the Grimsel hospice at N. foot of Grimsel Pass.

Strain and Stress. See ELASTICITY, MOMENTS, COMPRESSION, TORSION, and STEEL AND IRON CONSTRUCTION.

Straits Settlements, a British crown colony in and off the Malay Peninsula in S.E. Asia, including Singapore, Malacca, the Dindings, Penang, province Wellesley in Malaya, and Christmas Island, the Cocos-Keeling Islands, and the islands of St. Paul and Amsterdam in the Indian Ocean.

The native Malay protected states of Perak, Selangor, Sungei Ujong, Negri Sembilan, Pahang, and the sultanate of Johor, and other native Malay states, are within the sphere of influence of the government of the Straits Settlements, which has its seat at Singapore. The total area, excluding the islands in the Indian Ocean, is about 1,542 sq. m., and the population in 1901 was 572,249, consisting mainly of Chinese, Malays, Siamese, and Klings and other natives of India. Up to the year 1867 these settlements formed part of the government of India. The government of the Straits Settlements consists of a governor, an executive council of eight members, and a legislative council of nine official and seven unofficial members. Value of trade for 1904 — imports, £38,234,000; exports, £32,483,000.

Stralsund, tn., prov. Pomerania, Prussia, 86 m. by rail N.W. of Stettin, on the strait which separates the island of Rügen from the mainland. The town hall dates from the 14th century, the high school from 1550, and there is an arsenal. Chief manufactures, playing cards, machinery, electric lamps, sugar, and starch. Notable for its successful resistance to the siege by Wallenstein in 1628. It ceased to be a fortress in 1873. Pop. (1900) 31,076.

Stramonium, a name given in medicine to the seeds and leaves of *Datura Stramonium*, which contains an alkaloid daturine. This substance has an action almost exactly like that of atropine. Stramonium is extensively used in connection with spasmodic asthma, the extract being given internally, and the leaves smoked in the form of cigarettes.

Strand Magazine, THE, set the fashion in the cheap illustrated magazine. It was founded by Sir George Newnes in 1891, and at once achieved a remarkable success, in no small measure due to Dr. Conan Doyle's *The Adventures of Sherlock Holmes*. Other writers who have done much to give the magazine a foremost position are Mr. H. W. Lucy with his parliamentary articles *Behind the Speaker's Chair*, illustrated by Mr. F. C. Gould, and Mr. W. W. Jacobs. The *Strand Magazine* has always been profusely illustrated, and it introduced the habit of publishing photographs of curious and whimsical objects, and of celebrities at different periods of their lives.

Strange, SIR ROBERT (1721-92), Scottish engraver, born at Kirkwall in the Orkneys; was apprenticed to Richard Cooper the engraver. After spending several years in Paris and Italy, he returned to London in 1750. His

chief productions were *Magdalen* and *Cleopatra* after Guido, the *Apollo* and *Marsyas* of Sacchi, Vandeyck's *Charles I.*, and Titian's *Venus of the Florence Tribune*. See *Memoirs*, ed. James Dennistoun (1855).

Strangford, PERCY CLINTON SYDNEY SMYTHE, SIXTH VISCOUNT (1780-1855), British diplomatist, was born in London, and entered the diplomatic service as secretary to the legation at Lisbon (1802). It was at his suggestion (1807) that the Portuguese court removed to Brazil on the invasion of the country by the French. From 1808-15 he was envoy extraordinary to the Portuguese court in Brazil; and on his return was appointed ambassador to Sweden, to the Porte, and at St. Petersburg (1824). At Constantinople he was successful in obtaining concessions for the Sultan's Christian subjects. He retired in 1823, and as a Tory peer took an active part in the resistance to the Reform Bill. He published *Poems from the Portuguese of Camoens* (1803).

Strangles. See HORSE—Diseases.

Strangulation, a term applied in medicine to two conditions—(1) to forcible compression of the windpipe, whereby respiration is rendered impossible; and (2) to the constriction of any part of the body whereby the local blood supply is cut off, and whereby in a tubular organ such as the bowel the passage of contents is obstructed. Strangulation of the neck and air passages may be effected by a ligature or by manual pressure, the term 'throttling' being sometimes applied to the latter method. Death results from asphyxia. The bowel is the organ which is most frequently the subject of strangulation. A loop of herniated intestine is constricted at the ring through which it passes. So long as the constriction lasts the patient's life is in grave danger. Frequently vomiting is the first symptom, and if the strangulation remains unrelieved, the vomiting usually becomes stercoraceous. The hernial tumour becomes tense and hard, and the patient exhibits also the symptoms of shock and collapse. The only treatment consists in the liberation of the bowel from the constricting ring before gangrenous changes have set in, by surgical operation, if necessary.

Stranraer, royal and police bur. and seap. tn., Wigtownshire, Scotland, at head of Loch Ryan, 8 m. N.E. of Portpatrick; has creameries. Kennedy's Castle dates from the 15th century. Pop. (1901) 6,009.

Straparola, GIOVANNI FRANCESCO (c. 1495-c. 1557), Italian

novelist, was born at Caravaggio (Cremona), and lived much at Venice. His *Piacevoli Notti* (1550) are remarkable as the first modern European collection of tales based largely on folk-lore. The narrative, however fantastic the theme, is remarkably convincing. The best edition is that of Rua (1899 *et seq.*); Eng. trans. (1894) by W. G. Waters. See monographs by Rua (1889 and 1898) and Borromi (1899).

Strasburger, EDUARD (1844), Polish botanist, born in Warsaw; was appointed professor of botany at Jena (1869), and at Bonn (1881). He has devoted his scientific research mainly to the investigation of cell formation and fructification. Among his principal works are *Ueber Zellbildung und Zelltheilung* (1875), *Studien über*

seized by Louis XIV. in 1681, and capitulated to the Germans in 1870. Pop. (1900) 151,041.

Strategy and Tactics. Of the many senses in which these terms are understood, the meanings given by General Lewal in his *Etudes de Guerre* (1872) would appear to be the soundest. Strategy is the conceptive and directing element in war, while tactics are the executive element; or, as he puts it, 'strategy is the science of combinations, tactics that of their execution.' To strategy belong, then, the conception of a plan of campaign and its modifications as the war progresses, the choice of the objective and of bases for operations, the selection of lines of communication, the recognition of the value and possibilities of



Straits Settlements.

Protoplasma (1876), *Ueber den Bau und das Wachstum der Zellhäute* (1882), *Ueber den Befruchtungsvorgang bei den Phanerogamen* (1884), *Das Botanische Praktikum* (1884), and *Streifzüge an der Riviera* (1895).

Strassburg, fort. tn. and episc. see, Lower Alsace, Germany, on the Ill, a tributary of the Rhine. The famous minster was founded before 1015, and completed in 1439. The university (1,300 students), founded in 1621, suppressed in 1790, was reopened in 1872. Since 1877 many handsome public buildings have been erected—e.g. university, imperial palace, library, provincial government building, post office, and some churches. The principal manufactures are cigars, leather, surgical instruments, and machinery. Here the Emperor Julian defeated the Alemanni in 357. The town was

strategical points, the appreciation of natural lines of defence or offence, the direction of bodies of troops on these points and lines, the combinations of masses to support one another and to secure the advance of an army from interruption on the part of the enemy, their combination on the battlefield, the choice of points of attack and defence in battle, the bringing into play of moral forces by real or feigned threatening movements. To tactics belong, on the other hand, the methods of actual fighting, the arrangements made at a base, the inner organization and working of communications, the execution of marches, the laying out of camps, the erection of fortifications. Although the principles of strategy do not change with time, it does not follow that a strategic plan which might be

logical in one age will necessarily be so in another. But that is because tactics, the *execution* of operations, possible in one age, may no longer be so in another. Jomini, among others, makes use of the term *grande tactique*, and of recent years we have heard much of 'minor tactics.' Both are misleading terms; for while operations, of course, may be great or small, tactics can have no dimensions.

Important factors in strategy are the talent of the chief commanders and the quality and spirit of the troops with which and against which operations have to be conducted. Among the material elements are the objective, numerical strength, and topography of the theatre of war, its main strategic points, means of communication, resources, and climate, and the distribution of the enemy's army. The objective in a campaign will be to seize on a point or points the possession of which will so cripple the enemy as to make his further resistance futile, or the destruction of the enemy's armies so that the same end will be reached. But the unexpected is ever occurring in war, and the enemy's strategy cannot be accurately foreknown. Hence many alternatives must be contemplated in plans, and they must be liable to instant and frequent modification and development. In this, as a war proceeds, is the skill of an able commander displayed. A tactical success or failure at some point may un hinge a whole scheme and open up an entirely new phase of the war. The invention of explosives, the gradual perfection of firearms, the applications of steam and electricity, are among the many matters which have wrought modifications in tactics at different periods. Napoleon said that the nation which would maintain its military pre-eminence must change its tactics every ten years.

In barbaric warfare tactics were reduced to personal struggles between the combatants, armed with rudimentary weapons; the Greek phalanx trusted to its weight in shock; with the Roman legion, we see the progress of civilization in discipline, in organization, in fortification; but shock was still almost the only means employed to rout an enemy. The battles of the middle ages were contests with masses of ill-armed foot-soldiers and bodies of armoured horsemen; but the cultivation of archery and the invention of gunpowder and of artillery brought in, after a time, another element of destruction besides shock. The first standing armies contained a large number of pikemen to de-

liver or receive a charge, and of a smaller number of musketeers to assist by their fire in preparing an attack. The adoption of the bayonet turned every pikeman into a musketeer and musketeer into a pikeman, and thus greatly added to the share of fire-action in battle. Frederick the Great of Prussia successfully introduced a system of linear tactics, in which fire played a larger part than before in the action of infantry, and even a certain part in that of cavalry. Napoleon employed close columns of infantry, covered by the smoke from clouds of skirmishers until they reached near the enemy, when some of the columns deployed into line, fired so as to complete the demoralization begun by the skirmishers, and then the whole charged with the bayonet. He also used cavalry in large bodies, and handled his artillery in masses. The British army at the same period used linear tactics almost entirely, and to give development to the line and to the extent of its fire, the infantry was formed two-deep only, all foreign armies being then, and for long afterwards, three-deep formations in line. During the first half of the 19th century fire-action was still considered as a preliminary, preparing the way for shock by shaking and demoralizing the enemy. And owing to the very limited range of the early rifles it was still possible to bring infantry near enough to an enemy to deliver bayonet charges without exhausting the men's physical powers; while the cavalry could also find many opportunities for shock-action without suffering unduly from the slow, uncertain, and short-range fire of the enemy's flintlock muskets. But between 1850 and 1860 the expansive bullet, the rifle, and rifled artillery produced a great increase in range, rapidity of fire, accuracy, and effect. Gradually it was realized that dense formations and close-formed lines could no longer be used in presence of the enemy, and that in fighting tactics the vastly preponderating power is fire, shock-action being possible only in exceptional circumstances. The part played by cavalry in action has been sensibly diminished, but in another sphere it has grown greatly. In the case of an unseen enemy at great distances, safety depends upon far-reaching exploration and on screening the front and flanks of the army; and the arm fittest for this work is cavalry. The same necessity of dealing with an enemy at long ranges has led to a steady increase in the quantity of artillery with armies in the field, and the greater accuracy, rapidity, and

penetration of artillery, and even rifle, fire have enhanced the necessity of the use of intrenchments in the field. The need has also been felt of training cavalry to fight on foot, owing to its operations being frequently conducted without the support of infantry, and further of bestowing on it the protection, not only of horse artillery, but also of mounted riflemen and machine guns. See Maude's *The Evolution of Modern Strategy* (1905); *The Development of Strategic Science during the 19th Century* (trans. from Ger. of Von Caemmerer, 1905); and *Imperial Strategy*, by the Military Correspondent of the *Times* (1906).

Stratford, postal dist., Essex, England, 4 m. E.N.E. of St. Paul's, London, included in the borough of West Ham. The G.E.R. has a depot here. Pop. (1901) 44,827.

Stratford, cap. of Perth co., Ontario, Canada, on the Avon, 83 m. W. of Toronto. It has sawmills, flour mills, shoe factories, etc. Pop. (1901) 9,959.

Stratford de Redcliffe, SIR STRATFORD CANNING, VISCOUNT (1786-1880), born in London. He was called to assist his cousin, George Canning, at the Foreign Office; was then dispatched to Copenhagen, and finally to Constantinople, where after two years he became chief of the embassy. To his astuteness is attributable the treaty of Bucharest (1812), whereby Russia and Turkey, to Napoleon's chagrin, suddenly made peace, leaving the Czar free to hurl all his men against the French in their disastrous retreat from Russia. He was selected as minister to Switzerland, to help in formulating the Swiss constitution. That completed, he was sent to Vienna as British commissioner during the peace congress in 1815. He was next minister at Washington (1819-23), when he did much to soothe international irritation. During the Greek struggle for independence he was sent to Constantinople, and worked on behalf of the new Hellenic kingdom. After being stationed at Madrid, he sat in the House of Commons (1835-41) for King's Lynn. Then from 1842 to 1858 came his tenure of the ambassadorship at Constantinople, during which he virtually shaped the policy of Europe. The title he won then of 'The Great Elchi'—i.e. ambassador *par excellence*—stuck to him for the remainder of his life. On the termination of the Crimean war he retired. He was created viscount in 1852. His political articles were issued as *The Eastern Question* (1881), with a memorial notice by Dean Stanley. See *Life*, by Stanley Lane Poole (1888).

Stratford-on-Avon, tn., Warwickshire, England, 8 m. s.w. of Warwick. The church of Holy Trinity dates in part from the 12th or 13th century. On the north wall, above his grave, is a monument to Shakespeare, erected 1763. The house in which the poet was born is held as a public trust, as are also the site of New Place, where the poet spent his later years, and Anne Hathaway's cottage. There is also a library and museum, containing a large collection of Shakespearean literature. Of New Place little remains, the house having been destroyed in the 18th century. The Shakespeare Memorial (1879), a handsome building on the Avon bank, comprises theatre, picture gallery, and library. A memorial fountain (1887) was presented by Mr. Childs of America, and there is a fine memorial statue in bronze, the work of Lord Ronald Gower. The town hall is a much-altered early 17th-century building; the guildhall is ancient. Harvard House (16th century) was the birthplace of the mother of John Harvard, founder of the American university of that name. There are several old half-timbered houses. About one mile west of the town is Shottery, the early home of Shakespeare's wife, Anne Hathaway. Pop. (1901) 8,310. See Washington Irving's *Stratford-upon-Avon* (ed. 1900), and Ward's *Shakespeare's Town and Times* (1896).

Strath, in Scotland, the name given to a long and wide valley, often with a river running through it—e.g. Strathspey (valley of the Spey).

Strathalbyn, picturesque municipal township and tourist resort, S. Australia, co. Hindmarsh, 35 m. s.e. of Adelaide. Pop., with dist. (1901), 2,500.

Strathaven, mrkt. tn., S. Lanarkshire, Scotland, near the Avon, 16 m. by rail s.e. of Glasgow; has ruins of a 15th-century castle. Pop. (1901) 4,076.

Strathclyde, an ancient kingdom of the Britons, which at one time extended from Wales to the coast of Argyllshire in Scotland. The capital was Alclud or Dumbarton. See further under SCOTLAND—History.

Strathcona and Mount Royal, DONALD ALEXANDER SMITH, LORD (1820), Canadian statesman, was born at Forres in Scotland. At eighteen years of age he received a clerkship in the Hudson's Bay Company in Canada. In 1868 he was promoted to be chief executive officer in N. America. The Riel trouble in the Red River territories, or Rupert's Land, led to Smith's appointment as special commissioner of the Dominion government (1869). By a com-

bination of tact, discretion, and firmness he undermined the power of Riel, and prevented the outbreak of hostilities. Rupert's Land was transferred to Canada, and became the province of Manitoba. The welfare and development of the new territories became Smith's chief concern, and it was almost entirely due to his efforts that the construction of the Canadian Pacific Ry. was carried to a successful issue (1885). He was created K.C.M.G. in 1886, and in 1897 he was raised to the peerage. During the progress of the Boer war (1899–1902) he raised, equipped, and transported to S. Africa at his own cost a force of six hundred men, 'Strathcona's Horse,' drawn principally from the N.W. Territories of Canada. He and his cousin Lord Mount-Stephen set apart a sum of a million dollars for the erection of a free hospital in Montreal in commemoration of Queen Victoria's jubilee (1887), and subsequently they gave a further 800,000 dollars. In 1902 King Edward's Hospital Fund for London received from them an endowment fund producing £16,000 per annum.

Strathfield, ry. stn. and residential dist., New South Wales, Australia, 7 m. s. of Sydney, co. Cumberland. Pop. (1901) 2,994.

Strathfieldsaye, estate, Hants and Berks, England, 7 m. n.n.e. of Basingstoke; was presented by Parliament to the first Duke of Wellington in 1817.

Strathmore ('the great valley'), plain (100 m. by 5 m. to 10 m.), central Scotland, stretching between the Grampians on the N. and the Lennox, Ochil, and Sidlaw Hills on the S.

Strathnairn, HUGH HENRY ROSE, BARON (1801–85), British soldier, born at Berlin. He was sent in 1840 to co-operate with the Turks in expelling Mehemet Ali from Syria, and then spent seven years in Syria as consul-general. Both in the Crimea and in the Indian mutiny he rendered good service. In the latter he won successively the battles of Baroda, Madanpur Pass, Betwa, Jhansi, Kunch, Kalpi, Morar, and Gwalior. He was commander-in-chief of the Indian army. From 1865 to 1870 he was in Ireland during the Fenian scare, and for his services was raised to the peerage (1866), becoming field-marshal (1877).

Strathpeffer, health resort, Ross and Cromarty co., Scotland, 5 m. w. of Dingwall; has mineral wells (sulphurous and chalybeate). Pop. (1901) 354.

Strathspey, a Scottish dance, said to have originated in the strath, or valley, of the Spey about the beginning of the 18th century. Its music consists largely

of dotted quavers and semi-quavers, but the latter frequently prefix the former, in performance producing the effect known as the 'Scottish snap.' A strathspey is always followed by a quicker movement, termed a reel.



Stratiotes aloides.

1. Flower, petals removed.

Stratiotes, a genus of aquatic herbs belonging to the order Hydrocharidaceæ. The one species is the water-soldier, *S. aloides*, a native of Britain. It has great prickly leaves, not unlike those of the aloe, and bears in summer a flower-stalk, surmounted by a sheath containing several beautiful white flowers.

Strato, or STRATON, Greek philosopher, a native of Lampascus, was tutor of Ptolemy Philadelphus, king of Egypt, and head of the Peripatetic school at Athens from 288 to 270 B.C. He was famous for his study of natural science, and hence called himself Physicus.

Stratum, or BED, in geology, is a mass of sedimentary rock of great horizontal extent, which was deposited more or less continuously on the bottom of former seas or lakes, or sometimes on the surface of flat plains or deserts. The stratified rocks are mostly sandstones, shales, and limestones; other examples are coals, ironstones, cherts, conglomerates.

Stratus. See CLOUD.

Straubing, tn., prov. Lower Bavaria, Bavaria, on r. bk. of Danube, 25 m. by rail s.e. of Ratisbon. Fraunhofer was a

native, and here Agnes Bernauer was flung into the Danube. Manufactures bricks, lime, and cement; there are also breweries and tanneries. Pop. (1900) 17,450.

Strauss, DAVID FRIEDRICH (1803-74), German theologian, was born at Ludwigsburg, Württemberg. He was a pupil of Baur and of Schleiermacher, and in 1831 became a teacher at Maulbronn, in 1832 at Tübingen, and in 1835 published his celebrated *Leben Jesu* (trans. by George Eliot, *Life of Jesus*, 1846). This is mainly a negative work, which traces the formative forces of Christianity to the myth-making tendency—the myth being an idea parading as fact or event. Strauss was forced to abandon his tutorship, but he published an apology in 1838, making some concessions. Next year he was elected to a theological chair at Zürich; but the appointment was at once quashed, and Strauss in resentment published a fourth edition of his *Leben Jesu* (1840), in which he recanted all that he had previously conceded, and practically broke with Christianity. In the same year he issued *Die Christliche Glaubenslehre*, in which the distinctive doctrines of Christianity are attenuated to vague pantheistic notions of the Hegelian sort. In 1864 appeared a thorough recast of the *Leben Jesu*, specially 'composed for the German people' (trans. 1865), in which the traditional character of Jesus is shown to be a combination of Greek and Jewish elements—a Socrates misconceived as a magician. In 1872 appeared *Der alte und der neue Glaube* (*The Old Faith and the New*, 1873). Other works are *Ulrich von Hutten* (1859-60; trans. 1874), *Reimarus* (1862), and *Voltaire* (1870). See monographs by Zeller (1874), Biedermann (1875), Hansrath (1876-8); works ed. by Zeller (1875-7).

Strauss, JOHANN (1804-49), Austrian composer, born at Vienna. He founded a band of his own (1826), and from 1833 made highly successful tours throughout Europe. His waltzes—of which he wrote 152—are his best known compositions, and their charm of melody and brilliant instrumentation raised this form of music incalculably.

Strauss, LUDWIG (1835-99), Austrian violinist, born at Pressburg. From 1864 he resided in England; was for some time leader of Halle's orchestra in Manchester; became a member of Queen Victoria's private band, and solo violinist to her Majesty. For many years he made regular appearances at the Crystal Palace, Philharmonic, and Monday Popular Concerts, and had a great reputation as a quartet-player.

Strauss, RICHARD (1864), German musical composer and conductor, born at Munich. Since 1898 he has been court conductor at Berlin, and has conducted performances of his own works in nearly every European capital. His symphonies, etc., display a consummate knowledge of orchestration. His new opera *Salome*, founded on Oscar Wilde's drama of that name, was produced at Dresden in December 1905.

Straw, in manufacture, is used for hats, for thatching roofs, for mattresses, for door mats, and sundry other purposes. Straw-plaiting has long been practised in Italy, but does not appear to have been pursued in England till near the end of the 17th century, and then only by splitting the straw and using the splints. Leghorn hats, however, were still preferred to British. But the Tuscany variety of straw, that of *Triticum turgidum*, having been introduced and improved methods of manufacture, the industry in England now holds its own.



Wild Strawberry.

1, Section of flower; 2, carpel; 3, fruit.

Strawberry. The wild strawberry of British hedges and woods is *Fragaria vesca*; the garden varieties are chiefly derived from the Chilean strawberry (*F. chilensis*) and the Virginian species (*F. virginiana*). The haultbois (*F. elatior*) is also responsible for an important section. Strawberries do not appear to have been cultivated in English gardens until the 15th century. The strawberry succeeds best on a moderately heavy, rather rich, thor-

oughly drained soil, in an open, sunny situation. Planting should be performed in July or early in August, well-rooted runners being employed. They should be planted in rows at a distance of about eighteen inches from plant to plant, and about three feet between the rows.

After the crop has been cleared and the runners removed, it is a good plan to dress the plantation with burnt garden refuse; and if the soil is fairly well supplied with humus, a dressing of lime will be useful. As soon after the middle of February as possible spread round the plants some thoroughly-well-decayed manure, or a mixture of half manure and quarter part each of leaf-mould and burnt garden refuse. Directly the fruits have set an application of nitrate of soda at the rate of 2 lbs. per sq. rod will materially help the crop, but liquid farmyard manure given twice a week, from fruit-setting to the commencement of colouring, will prove even more beneficial. Where autumn manuring cannot be managed, a mixture of equal parts of kainit and bone meal, applied at the rate of 4 cwt. per acre, or say 3 lbs. per sq. rod, will give a good return. Straw should be placed around the plants as soon as the flower spikes appear, to keep them clean.

Strawboard. See PASTEBOARD.

Streatham, residential dist., Surrey, England, included in the metropolitan borough of Wandsworth, 6 m. S.W. of London. Thrale Place, in what is now Streatham Park, where Dr. Johnson was a frequent visitor, no longer exists. At Streatham are a Magdalen hospital and the British Home for Incurables (1894).

Streator, city, Lasalle co., Illinois, U.S.A., on Vermilion R., 82 m. S.W. of Chicago. Manufactures bricks and tiles, glass, and flour. Pop. (1900) 14,079.

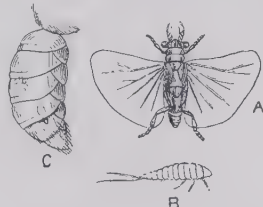
Street, GEORGE EDMUND (1824-81), English architect, born at Woodford in Essex; was a student under Sir Gilbert Scott, and designed and restored many churches, also the law courts in the Strand, London. One of his chief restorations was Christ Church, Dublin. Street was the author of *Brick and Marble Architecture of Northern Italy* (1855) and *Gothic Architecture in Spain* (1865). See *Memoir* by his son (1888).

Strelitzia, a genus of South American herbaceous plants, belonging to the order Scitamineæ. The flowers include three sepals, three petals, and five stamens. They are sometimes grown in a light peaty soil under glass.

Streltzi, or STRELITSKY. See RUSSIA—History.

Strength of Materials, in the widest sense, is the discussion of the manner in which metals, woods, stones, and all substances used in construction yield and finally break under systems of stress applied to them. This knowledge can be gained only by experiment, and the kind of test to be applied depends upon the nature of the stresses to which the material will be subjected. Every test involves two kinds of measurement—that of the stress applied, and that of the accompanying strain. (See ELASTICITY.) The various kinds of resistance presented by materials are usually classified under the following headings:—(1.) *Tensile strength and crushing strength*, in which the yielding and final breaking of a bar of the material under a longitudinal pull or compression are studied. (2.) *Resistance to bending*, in which the form of the bar is altered by combinations of transverse forces or loads. (3.) *Thrust resistance*, which has reference to the bending of a long bar under end thrusts. In this case the stresses are applied as in (1), but because of lack of perfect symmetry the bar begins to yield as in (2). Once the yielding has begun, the distribution of the stresses with reference to the geometrical configuration of the strained bar becomes changed. (4.) *Torsional resistance*, or the resistance presented to simple twisting forces applied to a column. This depends on the resistance to shearing of the material, taken in conjunction with the form of section of the bar or column. Only in the case of a bar of circular section is the initial small strain that is produced by a twisting couple one of simple twist. In the case of large strains simple twist is never met with. Unless otherwise stated, these several kinds of resistance to straining are assumed to have reference to continuous and continuously applied stress. But the stresses may be applied suddenly, as in impact, or may be subject to a periodic or rhythmic change; in both cases the material behaves in a fashion markedly different from its behaviour under similarly applied steady stresses. Finally, after the stresses have been applied and the material left to itself, it is important to consider the recovery, immediate and ultimate, partial or complete, of the material towards its original state. All this demands carefully planned series of experiments, involving the invention and construction of appropriate machinery and a detailed co-ordination of the many complicated results obtained. Another necessary line of experimenting is the study of temperature change

upon the strengths of materials. When a bar, say of iron, is subjected to any of the combinations of stress indicated above, and the strain is pushed up to and beyond the yield point, curious changes of texture take place. These changes indicate that the substance is yielding and flowing along stress lines, and a careful study of them, by microscope if necessary, may in certain cases serve to indicate the previous history of the piece under consideration. Very characteristic also is the fracture when the material finally breaks down. From the form and appearance of a fresh fracture important conclusions may be drawn as to the quality and homogeneity of the material. All the phenomena of overstrain go to show that a metal is not a homogeneous substance, but is built up of nuclei cemented together by intermediate material of a different physical and chemical character. There is indeed an approximation to a kind of crystallization. Any strain means the displacement among themselves of these nuclei, as well as a deformation of each nucleus. Statistically considered, the behaviour of the material as a whole may be expressed in a sufficiently simple mathematical form; and yet individually the elements of the material may undergo an infinite variety of strains and displacements. See books by Unwin (1888), Ewing (1899), and Thurston (1883). The most complete is perhaps *The Handbook of Testing Materials*, by Adolf Martens (Eng. trans. by G. C. Henning, 1899).



Strepsiptera.

A. *Stylops childrenti*, male. B. Do., young. C. Abdomen of bee, showing two *Stylops childrenti*, with young round head of female.

Strepsiptera, or BEE PARASITES, are curious insects, usually believed to be highly modified beetles (Coleoptera), which are parasitic upon the members of the order Hymenoptera (especially bees and wasps), and upon the Hemiptera. The best-known genus is *Stylops*, whence a bee affected with strepsipterous parasites is described as styloped, but in no case has the life-history been completely worked out. The larval *Stylops* is found in the larvæ of the bee, and the female never leaves its host, but grows

and develops with the latter. In the adult state it is wormlike, and protrudes a part of its body from the abdomen of the bee, apparently in order that its eggs may be fertilized. It produces an enormous number of minute young, which cover the body of the host like a fine powder; but the exact mode in which these find their way to new bee larvæ is obscure. The males are minute and winged, and after leaving the body of the host have a very brief (sometimes only from fifteen to twenty minutes) free life, during which they fly about with great rapidity, and presumably fertilize the sedentary females. As a rule, each bee carries only one parasite.

Streptocarpus, a genus of tropical and South African heba-ceous plants belonging to the order Gesneraceæ. They are usually woolly or hairy, and often stemless, with a leaf or leaves spreading close to the ground. They bear showy flowers, and are frequently cultivated under glass.

Stress. See ELASTICITY.

Stretcher, a stone or brick laid horizontally longways in a wall. A stretcher course is one without headers. See MASONRY.

Strickland, AGNES (1796-1874), English historian, was born near Southwold, Suffolk. Along with her sister Elizabeth she published *Lives of the Queens of England* (1840-8). Other works are *Letters of Mary Queen of Scots* (1842-3), *Lives of the Queens of Scotland* (1850-9), *Lives of the Bachelor Kings of England* (1861), *Lives of the Last Four Stuart Princesses* (1872), and volumes of poetry. See *Life* by her sister (1887).

Stricture, a contraction of a tube, a duct, or an orifice. The condition is most common in the male urethra, and is often due to cicatricial contraction following an ulcer. Forcible dilatation by bougies is often of service, but cutting operations may be required. In malignant stricture of the lower bowel it is sometimes necessary to make an artificial anus at a higher level.

Striegau, tn., Silesia, Prussia, 32 m. S.W. of Breslau; has manufactures of leather goods, brushes, and cigars. Pop. (1900) 12,853.

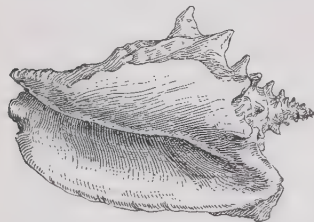
Strike, of strata, is the direction of a line drawn horizontally on their bedding planes. It is consequently at right angles to the dip. Thus in a basin-shaped bed the strike curves round in a circle. A sudden change of strike in a bed or series of beds may be produced by faults, which bring rocks having different directions of dip in contact with one another. The outcrops of strata correspond with their strikes only when the surface of the ground is a horizontal plane or the beds are vertical.

Strikes. See TRADE UNIONS.
Strindberg, JOHAN AUGUST (1849), Swedish novelist and dramatist, was born at Stockholm; began writing as an exponent of realism, passed through a phase of extravagant egotism, and then became a sort of Christian mystic. These successive phases are reflected in his books, while other pronounced characteristics of him as an author are his hatred of woman and his fondness for a semi-scientific treatment of his themes. Three books are especially characteristic of his first manner—*I Röda Rummet* (1879), *Det Nya Riket* (1882), and *Gästas* (1884-6). These led to his voluntary exile, and even to his prosecution for indecency and blasphemy. His best work is to be found in his stories of life in the Swedish Skårgård—*Hemsöborna* (1887) and *Skärkarlsstift* (1888); in the fairy play, *Lycko-Pers Resa* (1883); in the tales *Svenska, oden och Avenstyr* (1882-4); and in his dramas—e.g. *Fadren* (1887), *Gustavus Vasa, Erik XIV., Gustavus Adolphus, Carol XII.* (these four between 1899 and 1902).

String Courses are horizontal courses projecting beyond the face of a wall to break up what would be otherwise a monotonously smooth surface. They can be of horizontally carved mouldings or absolutely plain; but in either case the upper surface must slope outwards to run off the rain-water.

Stringhalt. See HORSE—Diseases of.

Stromboli, one of the Lipari Is., N. of Sicily, Italy, with an active volcano (3,040 ft.).



Strombus (S. gigas).

Strombus, or WING-SHELLS, a genus of marine tropical gastropods, in which the spiral shell has an expanded lip, deeply notched near the canal. The best-known species is *S. gigas*, from the W. Indies, with a shell weighing sometimes from four to five pounds. It is imported into Britain for cameo-carving, and is ground for use in the manufacture of porcelain. The animals are very active, and progress by leaps. They live chiefly upon carrion, and have very well developed eyes, placed at the ends of long stalks.

Stromness, seapt. tn., s.w. of Pomona, Orkney Isles, Scotland, 14 m. w. by s. of Kirkwall; has fishing and shipbuilding, and is a summer resort. Pop. (1901) 2,450. See Scott's *Pirate*.

Strongbow (d. 1176), surname of Richard de Clare of Strigul, son of the first Earl of Pembroke. Entering into an alliance with the king of Leinster, he married his daughter. Landing in Ireland, he took Dublin, and on the death of Dermot succeeded as king of Leinster. He became a vassal of Henry II., king of England, and seneschal of Ireland (1173).

Stronsay, isl., Orkney group, Scotland, 12 m. N.E. of Kirkwall. Area, 15 sq. m. Pop. (1901) 1,159.

Strontianite. See STRONTIUM.

Strontium, Sr, 87.6, a metallic element of the calcium family, found chiefly in celestine, SrSO₄, and strontianite, SrCO₃, derived from Strontian in Argyllshire. It is prepared by the electrolysis of its fused chloride, and is a hard yellowish metal, of specific gravity 2.5, which acts on water, setting free hydrogen. Of its compounds, strontium oxide, SrO, is a white solid-like quicklime, that slakes in a similar way to form the hydroxide, Sr(OH)₂. The salts of strontium are in general soluble in water, with the exception of the sulphate, phosphate, and carbonate, and are characteristic in imparting a brilliant crimson colour to the flame. Strontium hydroxide is used in the beet-sugar industry to recover crystallizable sugar from the molasses, and strontium nitrate in pyrotechny to make red fire.

Strophanthus, a genus of tropical shrubs and trees belonging to the order Apocynaceae. They are mostly natives of Asia or Africa, and of considerable beauty. They bear terminal cymes of large red, yellow, or white infundibuliform flowers. In Britain they require stove cultivation, a light peaty soil being the best compost. The seeds of *S. hispidus* are used in medicine, the alkaloid strophanthin acting as a cardiac stimulant and diuretic, much after the manner of digitalin.

Strossmayer, JOSEF GEORG (1815-1905), Austrian bishop and scholar, was born at Essek in Slavonia, and took a prominent part in the first council of the Vatican (1869-70). He was a zealous supporter of the Croatian nationalist aspirations, the creator of the existing educational systems of Croatia, Slavonia, and Dalmatia, and was made bishop of Diakovar in Croatia in 1849.

Stroud, mrkt. tn., Gloucestershire, England, 10 m. s. of Gloucester. The town hall dates from the 15th century. Stroud

is the chief seat of the west of England fine cloth manufacture, and has long been famous for its scarlet dyes. Pop. (1901) 9,181.

Stroud, tn., New South Wales, Australia, co. Gloucester, 32 m. N. of Raymond Terrace; has saw-mills. Pop. (1901) 4,000.

Structures, THEORY OF. All questions relating to the strength or stability of structures may form the subject-matter of this theory so far as they can be dealt with by the application of mechanical principles. The theory must begin with a consideration of the external forces which may be applied to the structure at different points under the action of loads, of earth pressure, or of fluid pressure; and its practical objects may be grouped under a few heads. (1.) To examine beforehand the equilibrium and the stability of any proposed structure; to answer the question whether it will stand in its designed form and position, or what will be the limits of its distortion or displacement under the external forces. (2.) To ascertain the magnitude of the stress that is borne by each member of the structure, so that the strength of each member may be adequately proportioned to its heaviest duties. (3.) To indicate the measures that can most effectively be taken to ensure the strength and stability of structures, and to adapt them for their purpose by making the best possible use of given materials. The first set of questions will have an important bearing upon the design of arches and suspension bridges, and also upon the stable construction of abutments, retaining walls, and masonry dams. The second will find an application in every kind of engineering structure, and especially in the braced framework of iron girders and roofs. The braced framework will generally be so designed that it can suffer no sensible distortion in its own plane except by a sensible lengthening or shortening of the component bars. It is then said to be 'perfectly braced'; and when this is accomplished without introducing any 'redundant' member (unnecessary for the specified purpose), the frame is called a 'statically determinate' structure. For all such cases the simple principles of statical equilibrium form the groundwork of a definite theory. This method fails, however, to yield a solution when the structure is 'statically indeterminate,' or, in other words, when it contains a 'redundant member.' In practice such cases are of frequent occurrence. A swing bridge resting upon its end supports, an arched rib without hinges or with only two hinges,

and any continuous girder of two or more spans are all of them statically indeterminate. (See further under ELASTICITY and STRENGTH OF MATERIALS.) The theory of structures proceeds upon certain lines of reasoning which can be expressed in the language of mathematics, involving sometimes the use of the differential calculus; but the processes can be aided and the reasoning illustrated by the use of graphic diagrams in which the rectangular co-ordinates are made to represent correlated quantities. See Rankine's *Civil Engineering* (1904) and *Applied Mechanics* (1904), Stoney's *Theory of Stresses* (ed. 1886), Baker's *Becams, Columns, and Arches*, Fidler's *Bridge-construction* (ed. 1901), and Ritter's *Bridges and Roofs* (1851).

Struensee, JOHANN FRIEDRICH, COUNT (1737-72), Danish statesman, born at Halle, Saxony, and was made (1768) private physician to King Christian VII. of Denmark. After reconciling the king and queen, Caroline, sister of George III. of England, his influence grew paramount (1770), and he became involved in an intrigue with the queen; the weak-minded king was excluded from affairs, and in July 1771 Struensee became prime minister. In domestic affairs he was one of the most energetic of the enlightened despots of the 18th century. His violence, remorselessness, and absolute disregard of the prejudices of the Danish people raised against him a strong national party, headed by the crown prince and the queen dowager. In January 1772 the conspirators forced the king to sign a warrant for the arrest of the queen and Struensee. The latter was beheaded in April. His tragic fate has been the subject of many plays. See Wittich's *Struensee* (1878), Blangstrup's *Christian VII. og Caroline Matilde* (ed. 1894).

Struma. See SCROFULA.

Struma, or KARASU, riv., Balkan peninsula, rising about 20 m. s. of Sofia, and flowing w. then s.e., through Bulgaria and the Turkish vilayet of Saloniki, to the Gulf of Rendida in the Ægean Sea.

Strut, in framed structures, any pillar that supports a weight or thrust in general; hence it is under compression, while a tie is in tension. See COLUMN.

Struthers, SIR JOHN (1823-99), Scottish anatomist, born at Brucefield, Dunfermline. He became assistant surgeon in the Royal Infirmary, Edinburgh (1854), full surgeon a few years later, and professor of anatomy in Aberdeen (1863). He returned to Edinburgh (1889), and was president of the Royal College of Surgeons (1895-7). He wrote *Anatomical*

and Physiological Observations (1854-63) and *Historical Sketch of the Edinburgh Anatomical School* (1867).

Strutt, JOHN WILLIAM. See RAYLEIGH, BARON.

Strutt, JOSEPH (1742-1802), English antiquary and engraver, was born at Springfield, Essex, and apprenticed to an engraver. After 1771 he devoted himself to study at the British Museum. His works are *Regal and Ecclesiastical Antiquities* (1773); *Manners, Customs, etc., of the People of England* (1774-6); *Chronicle of England* (1777-8); *Biographical Dictionary of Engravers* (1785-6); *Sports and Pastimes of the People of England* (1801; new ed. by J. C. Cox, 1904).

Struve, FRIEDRICH GEORG WILHELM VON (1793-1864), German astronomer, was born at Altona, and appointed in 1813 professor of astronomy at Dorpat, and director of the observatory in 1818. He issued in 1820 a catalogue of 795 double stars, and with a 9-in. Fraunhofer refractor he executed (1825-7) a review of the heavens, in the course of which he examined 120,000 stars and discovered 2,343 new pairs. These results were embodied in *Catalogus Novus* (1827), including 3,112 entries, and with details of measurement, in the standard work *Mensuræ Micrometricæ* (1837). Their proper movements were added in *Stellarum Duplicium Positiones Medice* (1852). Summoned by Czar Nicholas I. in 1835 to superintend the erection of the observatory of Pulkowa, Struve was installed as its director in 1839, and published in 1843 a catalogue of 514 double stars. He resigned in 1862. The measurement of the Russo-Scandinavian arc, 25° 20' in length, was completed under his direction in 1855. In *Etudes d'Astronomie Stellaire* (1847) he attempted to reinstate the stratum theory of the Milky Way.

Struve, OTTO WILHELM VON (1819-1905), German astronomer, was born at Dorpat. At the age of twenty he became assistant to his father, F. G. W. von Struve, at Pulkowa, and discovered before 1843 514 close double stars. Operations for the survey of the Russian empire were carried out in 1845-6, under his superintendence, and he succeeded his father as director of the Pulkowa observatory in 1862. The first estimate of the sun's velocity was given by him in 1842; he executed micrometrical measurements of Saturn's ring system in 1851, and again for comparison in 1882; and calculated the orbits of several comets and binary stars. He retired in 1889.

Strychnine, C₂₁H₂₂N₂O₂, a tertiary amine derived from pyri-

dine, and found in the fruit of *Strychnos nux vomica* and in St. Ignatius's bean to an extent varying from one to five per cent. The strychnine, with the brucine occurring along with it, is set free by treating the powdered seeds with lime, and extracted by a solvent, such as chloroform, from which, after separation in the form of sulphate, the brucine is dissolved out by dilute alcohol, and the strychnine is purified by crystallization. Strychnine crystallizes in small colourless trimetric prisms, which are slightly soluble in water, forming an intensely bitter solution. It forms salts with acids, the most important being the hydrochloride, which is also intensely bitter, but more soluble than the base itself. Strychnine is recognizable by the blue-violet colour it gives when its solution in concentrated sulphuric acid is acted on by potassium bichromate or other oxidizing agent, the colour soon changing to red and green. Small doses of strychnine or its salts are valuable as a stomachic, and as a heart and respiratory stimulant; but in larger amounts it acts as a virulent poison, setting up violent tetanic convulsions, which eventually cause death from exhaustion and suffocation. In cases of poisoning little can be done except by a medical man, whose aim is to relax the muscles by the action of anesthetics, such as chloroform, to remove the poison by powerful emetics or stomach washes, and finally, to keep up the respiration.

Strychnos, a genus of tropical evergreen trees belonging to the order Loganiaceæ. The most important member of the genus is *S. nux vomica*, whose seeds are used in medicine on account of the strychnine they contain.

Stryj, tn., Galicia, Austria, 40 m. s. of Lemberg, with tanning and the manufacture of matches. Pop. (1900) 23,205.

Strype, JOHN (1643-1737), English ecclesiastical historian and biographer, born in Stepney, near London; became minister of Leyton, Essex, in 1669. Strype's works are of great value to students of history. The principal are *Memorials of Cranmer* (1694), *Life of Sir John Cheke* (1705), *Annals of the Reformation* (1709-31), *Ecclesiastical Memorials* (1721). See Maitland's *Notes on Strype* (1858).

Stuart. See BUTE, EARLS OF. **Stuart**, LADY ARABELLA (1575-1615), daughter of Charles Stuart, Earl of Lennox, younger brother of Lord Darnley. During the first six years of his reign her cousin, James I., treated Arabella with consideration; but in 1603 she was suddenly arrested, owing,

it is supposed, to a rumour that she was engaged to marry a foreigner. She soon made her peace with the king; but in July 1610 James, on hearing of her secret marriage with William Seymour, threw the latter into the Tower, and placed Arabella in safe custody. In 1611 Seymour escaped to Ostend; but Arabella was captured near Calais, and being put into the Tower, her prolonged and hopeless captivity made her reason give way before death ended her sorrows.

Stuart, CHARLES EDWARD LOUIS PHILIP CASIMIR (1720-88), the 'Young Pretender' or 'Bonnie Prince Charlie,' was the eldest son of James Francis Edward Stuart. After seeing service in the Polish and Austrian Succession wars, he sailed to Scotland from France in 1745, and headed a movement on behalf of his father's claim to the English throne. He was joined by the Highlanders, and occupied Edinburgh, except the Castle. After holding his court at Holyrood, he defeated Cope at Prestonpans, and with 6,500 men marched into England. The quarrels among his followers led to diversity of counsels, and after reaching Derby he decided to retire to Scotland. Though Charles Edward won the battle of Falkirk on Jan. 17, 1746, he was overthrown by the Duke of Cumberland at Culloden on April 16, and fled to the western Highlands. Aided by the loyalty of the Highlanders and by Flora Macdonald, he escaped capture; and after five months of wandering about the west coast he reached France. After the treaty of Aix-la-Chapelle in 1748 he was not allowed to reside in France, and passed the rest of his life in various places on the Continent. In 1772 he married the Countess of Albany. See *The Lyon in Mourning and Itinerary* (Scot. Hist. Soc., 1895-7), Lang's *Prince Charles Edward* (1900), and Norie's *Life and Adventures of Prince Charles Edward Stuart* (1903-4).

Stuart, GILBERT CHARLES (1755-1828), American portrait painter, born at Narragansett, Rhode I.; studied under Benjamin West in London, and was very successful with portraits. He returned to America in 1792, and painted Washington, John Adams, and Jefferson. See Mason's *Life and Works* (1879).

Stuart, HENRY BENEDICT MARIA CLEMENT, DUKE OF YORK, CARDINAL (1725-1807), the second son of James Francis Edward, the 'Old Pretender,' took orders, and in 1747 received from Pope Benedict XIV. a cardinal's hat, and Clement XIII. appointed him to the see of Frascati. On the death of Charles Edward (1788) he styled

himself Henry IX., king of England. See Townend's *History of the Descendants of the Stuarts* (1858), Thornton's *The Stuart Dynasty* (1891), and Cavelli's *Les derniers Stuarts* (1871).

Stuart, or STEWART, JAMES. See MORAY.

Stuart, JAMES FRANCIS EDWARD, or the 'Old Pretender' (1688-1766), was the reputed son of James II. After an ineffectual attempt in 1708 to land in Scotland, he served with the French in the Spanish Netherlands—e.g. at Malplaquet. When he landed at Peterhead in December 1715 the rebellion in his favour was virtually over. After the alliance between England and France in 1717 he looked to Spain for assistance, but the expedition sent from that country in 1719 proved a failure. In 1719 James Edward married the Polish princess Clementina Sobieski. The pretender's dissolute life ended at Rome. See Room's *The Old Pretender* (1904), and Terry's *The Chevalier de St. George* (1890).

Stuart, JOHN (1813-77), Scottish genealogist, born at Forgue, Aberdeenshire. In 1853 he was appointed a searcher of records at the Register House, Edinburgh, and principal keeper in 1873. Chief works: *Sculptured Stones of Scotland* (1856 and 1867) and *The Book of Deer* (1869).

Stuart, MOSES (1780-1852), American theologian, was born at Wilton, Connecticut. In 1806 he was pastor of a Congregationalist church at New Haven, and from 1810 to 1848 was professor of sacred literature at Andover. He was the compiler of two Hebrew grammars (1813 and 1821), translated Winer's *Greek Grammar*, and wrote several *Commentaries*.

Stuart-Wortley-Mackenzie, JAMES ARCHIBALD. See WHARNCLIFFE, BARON.

Stubbs, CHARLES WILLIAM (1845), English theologian, was born at Liverpool. He was select preacher at Cambridge and at Oxford in various years between 1881 and 1904, and Lady Margaret preacher, Cambridge (1896); dean of Ely (1894). He is the author of *A Creed for Christian Socialists* (1896), *Historical Memorials of Ely Cathedral* (1897), *In a Minster Garden* (1901), etc.

Stubbs, or STUBBES, PHILIP (c. 1555-93), Puritan pamphleteer. His chief works are *A View of Vanitie and Allarum to England* (1582), *Anatomic of Abuses* (1583), *Rosarie of Christian Prayers and Meditations* (1583), *Theatre of the Pope's Monarchie* (1584), *A Christ Glasse for Christian Women* (1591), and *Motive to Good Works* (1593). See Dr. Furnivall's edition of the *Anatomic of Abuses* (1882).

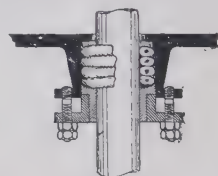
Stubbs, WILLIAM (1825-1901), English prelate and historian,

was born at Knaresborough, became fellow of Trinity College, Oxford (1848), and in 1866 regius professor of modern history. Archbishop Longley made him librarian at Lambeth in 1862. He was a curator of the Bodleian in 1868, canon of St. Paul's (1879), bishop of Chester (1884) and of Oxford (1889). His historical works are of high authority. Among these is his standard *Constitutional History of England* (1874-8) to the accession of the house of Tudor, *The Early Plantagenets* (1874), *Lectures on European History* (ed. 1904), and *Lectures on Early European History* (ed. 1906). His *Letters* were issued (1904) by W. H.utton.

Stucco, made by mixing plaster of Paris with solution of size, sets to a fairly hard material used for decorative purposes.

Stud Book, THE GENERAL, a volume, issued every five years, containing pedigrees of race-horses. All mares and their progeny which have a right to be included under the heading 'thoroughbred' are herein catalogued, whether destined to race or not. If the name of a mare does not appear in *Weatherby's Stud Book*, she is said to be 'half-bred' (h.b.).

Stuffing. See TAXIDERMYY.



Stuffing-box.

Stuffing-box, a contrivance for preventing leakage when a moving rod passes through the side of a vessel containing a fluid. The illustration shows the commonest type. The box itself forms part of the casting through which the rod passes. It is fitted with a brass bush, to form a bearing surface for the rod, which is easily replaced by a new one when necessary. The packing, which usually consists of asbestos or hemp, is placed round the rod and compressed against it by means of a gland, fitting round the rod, and held down by two or more bolts or studs. Small glands are usually made entirely of brass. Various forms of metallic packing are used instead of soft packing. They usually consist of two or three rings of white metal, pressing against the rod, and held in a specially made box. Though more expensive, they require less attention than soft packing, and do not wear the piston rod to the same extent.



*'Bonnie Prince Charlie' (Prince Charles Edward Stuart).
From the painting by John Pettie, R.A.*

Stuhlweissenburg (Hung. *Székes Fehérvár*), tn., Hungary, in co. of same name, 51 m. by rail s. of Komorn. It is the seat of a bishop, and manufactures cloth, flannel, machinery, knives, and soap. From 1027 to 1527 the kings of Hungary were crowned and buried here. Pop. (1900) 32,167.

Stukeley, WILLIAM (1687-1765), English antiquary, born at Holbeach, Lincolnshire; practised medicine in Boston, London, and Grantham. In 1729 he took holy orders, and became rector of St. George-the-Martyr in London. Among his publications are *Account of a Roman Temple near Graham's Dike in Scotland* (1720), *Itinerarium Curiosum* (1724), and *Stonehenge* (1740). See *Family Memoirs of Stukeley* (1882).

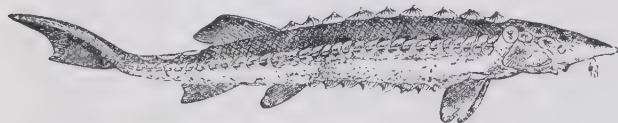
Sturdy, or GID. See SHEEP—*Diseases*.

Sturdza, DIMITRIE (1833), Roumanian statesman; laboured zealously for the union of the principalities, and actively contributed to the fall of Prince Cusa (1866); held office (1876-88) repeatedly under Charles I., and was twice prime minister (1895

cousin, Sten Sture the elder, and carried on a successful war with the Danes.

Sturgeon belongs to the family Acipenseridae, a group of ganoid fishes. The species are exclusively inhabitants of the temperate zone of the northern hemisphere, and are either entirely confined to fresh water or pass a part of the year in rivers to spawn. They are large, sluggish fishes, some reaching a length of over ten feet, and live upon worms, crustaceans, and molluscs, which they rout out from soft bottoms with their snout. The common sturgeon (*Acipenser sturio*) occurs in British waters, and occasionally ascends rivers, as the Severn; it is sometimes caught by trawlers, more frequently in stake nets. The body is long and narrow, with five rows of bony shields. In Russia the sturgeon fishery is one of great importance, the fish being valued for its flesh, its roe, of which caviare is made, and its sounds, from which isinglass is prepared. Of late years sturgeons have been artificially propagated in Russia and America.

Sturluson. See SNORRI.



Sturgeon.

and 1897). He was subservient to Hungary when in office. He is the editor of collections of historical documents—e.g. *Documente privitoare la Istoria Românilor* (30 vols. 1876-97) and *Acte si Documente privitoare la Istoria Renascerei României* (8 vols. 1888-98).

Sture, STEN, the elder (d. 1503), was a stout opponent of the Union of Calmar, and in 1470 was elected administrator by the Swedes, and after defeating the Danish king, Christian I., at Brunkeberg (1471), maintained his position for the next twenty-six years. He founded the university of Upsala (1477) and introduced printing. From 1501 he was again administrator till his sudden death at Jönköping.

Sture, STEN, the younger (?1492-1520), son of Svante Sture, was elected (1512) administrator of Sweden, which he defended against the Swedish magnates under Trolle, and against Christian II. of Denmark, and was mortally wounded at Bogesund (now Ulricehamn) fighting against the Danes.

Sture, SVANTE (d. 1512), was elected administrator of Sweden (1504) after the death of his

Sturm, JOHANNES (1507-89), educational reformer, born at Schleiden (Luxemburg). He reorganized (1536 onwards) the educational system of Strassburg, which became the model of other municipal systems of education. His idea was to attain excellence by a careful progression from lower to higher in the character of the studies. To this end he established a gymnasium and an academy, which in many respects approximated to a university. He also considered that all instruction should have an ethical and a spiritual side. He was a prolific writer, and used his influence in support of Zwingli. See C. Schmidt's *La Vie et les Travaux de Jean Sturm* (1855), and *Lives* in German by Laas (1872) and Kückelhahn (1872).

Sturm, JULIUS KARL REINHOLD (1816-96), pseudonym of Julius Stern, German poet, born at Köstritz in Reuss the Younger, and became tutor to the prince of Reuss-Schleiz, and pastor of Göschwitz (1851), and of Köstritz (1857). Among his works are *Für das Haus* (1862), *Stilles Leben* (1865), *Israelitische Lieder* (1867), *Von der Pilgerfahrt* (1868), *Lieder und Bilder* (1870), *Kampf*

und Sieger-gedichte (1870), and *Das Buch für meine Kinder* (1877).

Sturm und Drang. See GERMAN—*Language and Literature*.

Sturt, CHARLES (1795-1869), Australian explorer, was born in the Bengal Presidency, and went to Sydney (1827). He led several expeditions into the interior, and during the last suffered such privations that he returned almost blinded. He published *Journals* (1833), *Narrative of an Expedition into Central Australia* (1849).

Stuttering. See STAMMERING.

Stuttgart, tn., cap. of kingdom of Württemberg, beautifully situated on the Neckar, 115 m. w. by N. of Munich. The old castle, now used as government offices, was built in 1553-70. The other notable buildings include the royal palace (1746-1807), the theatre, railway station, Akademie (formerly Carl school), polytechnic, conservatory of music, library, national industrial museum, and picture gallery. The city is one of the chief publishing centres in Germany, and manufactures furniture, pianos, chemicals, colours, chocolate, carriages, and leather. Here were born: Hegel, Hauff, and Schwab. The counts of Württemberg took up their residence here in 1316. Pop. (1900) 176,699.

Stuyvesant, PETER (1592-1692), governor of New York, was born at Amsterdam, and appointed governor of the Dutch possessions in North America (1646). He was practically the founder of New York, which he called 'New Amsterdam.' His farm, 'Groet-Bouwerie,' situated near the city, gave its name to 'the Bowery,' one of the thoroughfares of New York.

Stye, or HORDEOLUM, an inflammation of the sebaceous gland of a ciliary follicle at the margin of the eyelid. It is usually associated with some constitutional derangement, the exciting cause being often over-use of the eyes, especially in hypermetropic subjects who are exposed to cold. A sty begins with redness, pain, and swelling. After three or four days a point of suppuration appears, generally at the base of an eyelash. Styes often appear in crops, either simultaneously or successively. Treatment should be directed towards the improvement of the general health. Iron, quinine, and cod-liver oil are generally indicated, and small doses of calcium sulphide are useful. Locally the eyes should have rest, and the pain may be relieved by hot fomentations or weak lotions of acetate of lead. When suppuration appears, an incision relieves the pain and accelerates the cure.

Style, OLD AND NEW. See CALENDAR.

Stylites, ST. SIMEON, a monk of Syria, in the 5th century, who spent many years of his life on the top of a pillar, over seventy feet high and only four feet square, which he caused to be erected near Antioch. For thirty years (429-459) he occupied this dizzy altitude, engaged in meditation, prayer, and preaching. He died on his pillar and was buried in Antioch. The term 'Stylites' comes from the Greek, *στυλος*, 'a pillar.'

Styptics, a term now restricted to local applications employed to arrest hæmorrhage.

the Grundel. It is exceptionally rich in mineral springs, which have given rise to numerous health resorts. The principal town is Graz. About 1180 it became a duchy, and was finally incorporated with Austria by Rudolph I.

Styx, a waterfall in N.E. Arcadia in ancient Greece, falls over a huge cliff in two cascades, and their waters uniting form a torrent which joins the Crathis. In later literature the Styx became one of the rivers of the lower world. Its waters were held to be poisonous.

Suabia. See SWABIA.

Suaheli. See SWAHELI.

Suakin, seapt. tn. and govern-

His chief work, *Tractatus de Legibus ac Deo Legislatore*, is written from the point of view of a Thomist, though on some matters he endeavoured to discover a *via media* between the realism of Scotus and the nominalism of Occam. At the request of Pope Paul V, he wrote (1613) *Defensio Catholicæ Fidei contra Anglicanæ Sæctæ Errores*, which James I. ordered to be burned by the common executioner. His collected works were published at Besançon (1856) and in the Migne collection. See *Life* in Latin by Deschamps (1671), and Werner's *Franz Suarez und die Scholastik der letzten Jahrhunderte* (1861).



Stuttgart: the Market Place.

Ice, cold water, ferric chloride, alum, tannin, and lead acetate are the styptics in most general use; but the actual cautery is sometimes applied when the site or nature of the hæmorrhage renders other applications futile or undesirable. Styptics are applicable to hæmorrhages from the smaller vessels only.

Styria (Ger. *Steiermark*), duchy and crownland of Austria, bounded N. by Upper and Lower Austria and E. by Hungary and Croatia. Area, 8,670 sq. m.; pop. (1900) 1,356,494. It belongs to the Eastern Alps, and is traversed by the rivers Mur, Drave, Save, and the Enns. There are numerous picturesque Alpine lakes, notably

ship, Egyptian Sudan, on w. coast of Red Sea, occupies a coral islet close to the mainland. Tobacco, ivory, gums, and mother-of-pearl are exported. Here Mohammedan pilgrims embark for Jiddah on the E. side of the Red Sea. In 1906 the title of the governorship was changed to Red Sea Governorship. Pop. 12,000.

Suarez, FRANCISCO (1548-1617), Spanish Jesuit theologian and casuist, born at Granada; became professor of theology at Segovia, though he also lectured at Valladolid, Coimbra, and at Rome. His system owed much to the Molinists, though on the doctrine of 'grace' he formulated new principles for himself, which were afterwards adopted by the order.

Subahdar, originally the title of a governor of a province under the Mogul rule in India. It is now the designation of a native captain in the Indian army.

Subaltern, in the British army, an officer who ranks below a captain. The term is therefore applicable to lieutenants and sub-lieutenants.

Subconsciousness is broadly the sum-total of organized mental possessions not at the moment in the focus of consciousness. Thus the processes in subconsciousness are as various as those in consciousness and of the same kind. They take origin in the ordinary course of conscious acquisitions—e.g. the subconscious movements neces-

sary in violin-playing, painting, or any similar craft; or in the marginal impressions not at the time attended to, but unconsciously recorded, as in innumerable suggestions arising without apparent sense-impressions; or in organic processes, which are not associated with a definite end-organ, yet affect the feelings; or in dreams, and generally as the result, direct or indirect, of all conscious processes, forgotten and unremembered. The study of personality, double and multiple, has shown that those subconscious processes may be elaborately organized into mentally continuous systems simulating personality. It is contended by many (Myers, James, and others) that the subconscious is a fountain of new mental revelations. But so far it has not been conclusively shown that subconsciousness contains anything disparate in kind from consciousness, or that there is any new nervous or mental organ of acquisition not known to ordinary consciousness. See Ward's article 'Psychology' in *Encyc. Brit.* (9th ed.), James's *Principles of Psychology* (1890), Baldwin's *Handbook of Psychology* (1891), Hamilton's *Metaphysics* (1870), Carpenter's *Mental Physiology* (ed. 1876).

Subiaco (anc. *Sublaqueum*), tn., prov. Rome, Italy, in the Sabine Mts., 30 m. E. of Rome; has remains of one of Nero's villas, an 11th-century castle (a former papal residence), and the early monasteries of St. Benedict and St. Scolastica. Pop. (1901) 8,003.

Subinfecundation. See **QUIA EMPOTORES**.

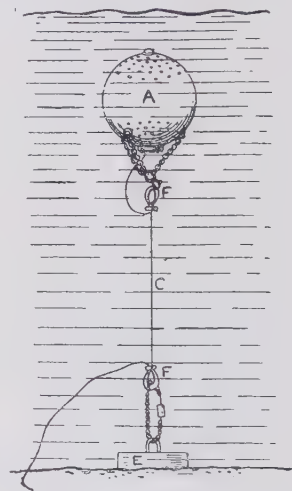
Subject, Subjective, Subjectivity. The term subject has been used in two senses in philosophy: (1) in the sense of a subject of attributes; (2) in that of the subject as contrasted with the object in the analysis of cognition. With these two meanings of subject may be connected the curious change which has taken place in the meaning of the antithesis of subjective and objective. According to the usage which obtained in scholastic philosophy, and which was carried over into the early modern period, subjective meant pertaining to the existing thing or subject of attributes; objective, on the other hand, referred to the thing as a mental object or as conceived by the mind. But when the other meaning of subject came uppermost, the usage of the antithesis came in the course of modern philosophy to be completely reversed. Subjective now means pertaining to the subject in knowledge, whereas objective refers to a thing (or conception) regarded as having independent existence for validity), and therefore as

much more than a mere representation in the knowing subject's mind. Hence the epithet subjective is very often used to denote the *merely* subjective—that which has no existence (or validity) beyond the subject's mind. Errors and prejudices are subjective as contrasted with the truth; illusions and hallucinations are subjective as contrasted with the realities which they misrepresent. But although the subjective and the objective are continually being contrasted, it does not follow that there is any necessary opposition between the two. For what is subjective in the sense of being known, or contained in the mind of the individual, need not be subjective in the sense of being misrepresented or unreal. When this simple enough truth is lost sight of, the subjectivity of knowledge may easily be interpreted in a way which leads straight to phenomenalism or relativism. (See **RELATIVITY OF KNOWLEDGE**.) And Kant himself, to whom we owe the general currency of the antithesis, affords, in his doctrine that human knowledge can never reach the truly objective or unphenomenal things in themselves, a conspicuous illustration of this error. Cf. Nettleship's *Philosophical Remains* (2nd ed. 1901, p. 195 ff.).

Sub-lieutenant. See **LIEUTENANT**.

Sublimation. When a substance on heating passes straight from the solid to the gaseous state without intermediate liquefaction it is said to sublime, and the change takes place in the reverse direction on cooling. This behaviour is due to the fact that the boiling-point of the substance under the particular pressure is lower than the melting-point. It thus depends on the pressure, which if increased will require a greater vapour pressure to overcome it and need a correspondingly higher temperature, so that, if the external pressure is raised sufficiently, a substance that sublimates at a lower pressure can be made to melt and boil as usual. Thus, if some iodine is heated in a vacuum tube, it sublimates without melting, though in a tube containing air at a pressure slightly above that of the atmosphere the iodine melts. In some cases of apparent sublimation the action is of a different kind; thus, though ammonium chloride apparently sublimates on heating, it really decomposes into hydrogen chloride and ammonia, recombination to solid ammonium chloride occurring when it cools again. Sublimation is used both in the laboratory and commercially to separate and purify such substances as arsenic, camphor, iodine, theine, and the like.

Sublingual Glands, salivary glands in the floor of the mouth, close under the mucous membrane, one on either side of the frænum (bridle) of the tongue. They secrete saliva through numerous ducts of Rivini, some of which unite to form the duct of Bartolin. The secretion contains ptyalin and mucin, and is alkaline. See **SALIVA**.



Submarine Mine.

A, Electro-contact mine; C, cable; F, mooring thimble; E, sinker.

Submarine Mines are explosive devices, intended to be laid beneath the surface of the water in channels and harbour mouths, for the destruction of hostile vessels. In the civil war in America, Admiral Farragut's experience showed that they could not always be depended upon. In those days they were usually made of gunpowder barrels fitted with fuses; but at a later date gun-cotton, or some form of dynamite, was commonly used as the explosive medium, with a detonator of fulminate of mercury. Submarine mines are of four kinds—(1) observation mines; (2) electro-contact mines; (3) electro-mechanical mines; and (4) extemporized mines. (1.) Observation mines, as used in the British service, are controlled from a distant observation station, generally on shore, and fired by electricity. The best depth for these mines is about fifty feet below the surface. (2.) Electro-contact mines are intended for explosion in actual contact with a ship's bottom, and explode upon receiving a violent blow, or upon being tilted sideways to an angle of 70°, whereupon a body of mercury comes in contact with a spindle and completes an electrical cir-

cuit. (3.) Electro-mechanical mines differ from electro-contact mines in that they themselves contain the firing battery. (4.) Extemporized mines may be made by filling a barrel or box with gunpowder or gun-cotton, and fitting an electrical fuse to it. A good impromptu mine may be made by lashing two empty ten-gallon barriques to a twelve-foot plank, placing a gun-cotton charge under the plank, and firing it by electricity.

Submarine mines are usually attacked by countermining, which consists in laying a fresh line of mines across or near a mine-field, and in causing the explosion of the old mines by the concussion

royal navy. See Bucknill's *Submarine Mines and Torpedoes* (1889), and Fyfe's *Submarine Warfare* (1902).

Submarine Mining, SCHOOLS OF. These are situated at Portsmouth, Chatham, Plymouth, and Sheerness, and were transferred to the navy from the Royal Engineers in 1905. Several courses of training in every branch of submarine mining are held annually.

Submarine Navigation. In a paper published in Edinburgh on June 7, 1596, John Napier of Merchiston speaks of 'devices of sailing under the water,' which he 'hopes to perform.' An attempt was made in James II.'s reign to row a boat under water.

The dimensions were—length, 123 ft.; beam and depth, 12 ft.; and the engines were of 1,000 indicated horse-power. At a displacement of 160 tons she floated. When it was intended to submerge her, her funnels were stowed, and water-tight scuttles were fitted over the aperture. Under water, the fires were extinguished by means of steam, and superheated steam then became the motive power. The sinking was effected partially by the admission of water, and completely by means of two vertical screws, which worked in apertures in the vessel's bottom, and pulled her down to the desired level. About 1838 Goubet, a Frenchman, invented a

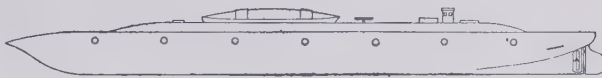


Fig. 1. The Plongeur (139 ft. x 12 ft.)



Fig. 3. The Goubet II. (26 ft. x 6 ft.)

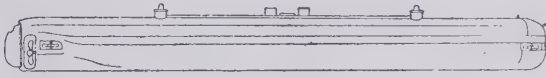


Fig. 2. The Nordenfelt (125 ft. x 12 ft.)

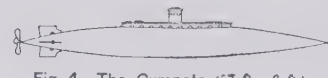


Fig. 4. The Gymnote (57 ft. x 6 ft.)

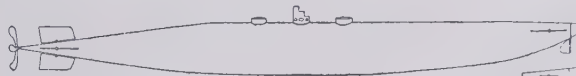


Fig. 5. The Gustave Zede (131 ft. x 12 ft.)

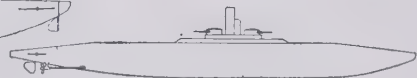


Fig. 6. Holland—1st type (85 ft. x 11 ft.)

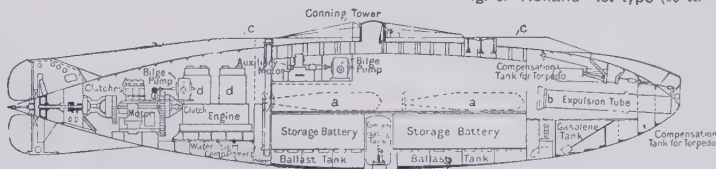


Fig. 7. Section showing construction of modern Holland type submarine (63 ft. 4 in. x 11 ft. 9 in.)

Types of Submarines.

resulting from firing the new ones. Another method of attacking submarine mines is by sweeping, which consists in sending a pair of boats, connected by means of cables fitted with grappling irons, and sometimes with explosive charges, to drag over suspected mine-fields. Yet another method, known as creeping, consists in towing a grappling iron across the suspected course of the cables of a mine-field, picking them up, and cutting them. In 1905 the British government decided to abandon submarine mining as a method of coast defence, and the force of Submarine Miners was disbanded, and their work taken over, in part, by the

In 1774 a man named Day was drowned in Plymouth Sound in a submarine boat which he had invented; and at about the same time Bushnell of Connecticut and Robert Fulton made other unsuccessful experiments. In 1860 the Plongeur submarine, designed by Bourgois and Brun, and built at Rochefort, was propelled by compressed air; but the vessel was not a success. In 1887 Nordenfelt launched at Barrow a boat with a displacement of 243 tons. The general shape resembled that of a huge Whitehead torpedo, but the bow and stern were flattened perpendicularly, and on the turtle back there were two small conning towers.

boat driven by electric accumulators. In the following year the *Gymnote*, the invention of Gustave Zédé, was built for the French government, and, in 1893, was followed by the *Gustave Zédé*, an improved and larger craft of somewhat similar type. This boat is 131 ft. 3 in. long, and has a displacement of 266 tons. She is driven by electrical accumulators, and it is said that she has made comparatively long passages at considerable depths beneath the surface, has remained with her crew under water for many hours at a time, and has repeatedly discharged torpedoes while immersed. Other continental submarine boats are those

of Hovgaard and Peral. In America J. P. Holland brought forward his submarine, which, in its first type, was 85 ft. long, with a greatest diameter of 10'9 ft., and a submerged displacement of 120 tons. Improved Holland boats have since been adopted by the United States government; and in 1900 the British government also ordered six boats, designed on the same plan, to be built for it by Messrs. Vickers Sons and Maxim. The dimensions are—63 ft. 4 in. long, and 11 ft. 9 in. broad; and the submerged displacement is 120 tons. The Holland boat is designed to carry three torpedoes, and has an ex-

which have a displacement of 300 tons, of 850 horse-power, a surface speed of 13 knots, and a radius of action of 500 miles. In 1905 the British government decided to rely upon torpedoes and submarines for harbour and coast defence, and to discontinue the use of submarine mines for that purpose. See Burgoyne's *Submarine Navigation* (1903), and Pesce's *La Navigation sous-Marine* (1906).

Submarine Telegraphy. See TELEGRAPHY.

Submaxillary Glands, the salivary glands which lie one on each side of the throat, close against the inner border of the lower jaw. See SALIVA.

with bones of elk, beaver, wild ox, and other animals which no longer inhabit Britain. Professor James Geikie has arrived at the conclusion that there were two forest epochs, separated by a period of greater cold, in which glaciers formed in the higher valleys, and actually reached the sea in some of the mountainous districts of the north-west of Scotland. In all probability Britain was at that time united to the Continent and to Ireland, and a great part of the North Sea was a flat plain drained by the Rhine and other rivers.

Subornation. See PERJURY.
Subpcena, a writ commanding



Remains of a Submerged Forest (Scotch Pine).

r. Peat; s. sand; n.c. blue clay.

[Photo by Welch, Belfast.]

plosion tube forward. She has a deck 31 ft. long on her back for surface running. She has four-cylinder marine engines driven by gasoline for surface work; but when submerged, she is driven by electricity at a maximum speed of 7 knots. French submarine construction appears to tend towards two types of vessel—one of about 400 tons, with 600 horse-power, and a surface speed of 12 knots (these for aggressive purposes on an enemy's coasts), and small vessels of about 100 tons displacement, or even as small as 68 tons, for harbour defence. In addition to the Holland type of boats described above, the British government are building a class (B) of vessel

Submerged Forests are found at several places around the shores of the British Isles, their roots and stumps becoming exposed at low tide, standing in the position in which they grew. They are known in Cornwall (Mount's Bay), along the shores of the Bristol Channel, on the south coast of England (Poole, Torbay, Bournemouth, Bognor, St. Leonard's), at the mouths of the Humber, the Mersey, in the Firth of Forth, and in the Orkney Islands. They are evidently for the most part of post-glacial age, though a few may belong to the later interglacial periods; and weapons of stone and bronze have been occasionally found in them, together

a witness to attend, under a penalty, at a particular place and time. A subpoena *ad testificandum* is used for the purpose of compelling a person to give evidence; a subpoena *duces tecum*, to produce documents in his possession. In civil cases a person is entitled to be paid his expenses before giving evidence.

Subrogation. All contracts of fire and marine insurance are contracts of indemnity, and the underwriter, in consideration of the indemnity, is 'subrogated' to the insured—i.e. he is entitled to stand in the shoes of the insured and recover anything the latter could have recovered by enforcing rights of action against third parties.

Subsidence, or the sinking of the land, a process which is going on, for instance, in the south of Sweden. In W. Greenland there is a steady depression of the land taking place along the coast. Near Naples and in Ischia, Roman baths and piers are now constantly beneath water. Unequal tilting of the land has been proved around the great lakes of N. America. In Britain there is evidence of depression in submerged forests and deep river valleys passing down below the sea. This is also seen on the east coast of N. America. Earthquakes are supposed to have an intimate connection with movements of the earth's crust, and many localities are known (New Zealand, Japan, Cutch in India, Chile) where a sudden uplift or subsidence has accompanied a seismic disturbance. There has been much discussion whether the changes of level are best explained as due to movements of the sea or of the land; but the majority of geologists at the present day hold that the facts support the hypothesis of warping and flexure of the earth's crust, while the sea plays merely a passive rôle.

Subsidies. A subsidy is a pecuniary grant in aid. The term is used of annual payments of money by one country to another to secure its neutrality or assistance in war, or to induce it to act in accordance with the advice and in the interests of the country granting the subsidy. The payments made by the government of India to the Ameer of Afghanistan are of this nature. Again, subsidies are government grants in aid of private commercial enterprises, such as shipping companies, either for keeping up lines of transportation, or for carrying mails, or for maintaining vessels of a type that may be useful in war. In the history of English taxation the term has had several meanings. In its most general sense it meant a grant by Parliament in aid of the ordinary revenues of the crown. It was also applied to certain export and import duties called tonnage and poundage; and finally it meant a special tax of two shillings and eightpence on movables, and four shillings on land which was granted to the crown in the 16th and 17th centuries.

Subsoil, the layer of soil which lies beneath the surface soil. The surface soil is usually more or less altered by the decomposition of leaves, stems, and roots which fall on it or die within it, whereas the subsoil only contains such organic products as are dissolved by water and washed through the surface soil by rain. Subsoil is not usually, therefore, in a suffi-

ciently 'alive' condition alone to support the lives of plants. At the same time, it is often rich in those mineral constituents of which the surface soil may have been robbed by succeeding generations of plants. The value, therefore, of gradually mixing a certain proportion of subsoil with the surface soil is obvious.

Substance, from the Latin word *substantia*, 'being,' which was capable of being used in different senses. It could denote either the concrete individual—e.g. this or that man (its primary signification for Aristotle); or, again, the general nature common to the members of a class, as humanity is to all men (the essence or Platonic idea)—an ambiguity to which Christian theologians owed some of their difficulties and disputes in their attempts to define the doctrine of the Trinity. The philosophical doctrine of substance took on a different aspect, according as one or other of these two meanings was uppermost. Thinkers of a Platonic tendency, like the scholastic exponents of realism, regarded the essence or universal as having a higher or truer reality than the individual, and similarly the wider universal was always a higher reality than the narrower. The logical outcome of this line of thinking is that God, the highest reality, is conceived as infinite being or substance, but being which, as infinite, is emptied of all positive determinations, since any positive determination would seem to 'limit' it and make it finite. In the Cartesian philosophy essentially the same type of doctrine is present, and comes to its full expression in Spinoza, who recognizes in God the one and only substance of which all finite things are but the transitory modes. The monadism of Leibniz may be regarded in relation to Spinoza as an expression of the opposed view, that the individual is the true reality. But the type of doctrine opposed to realism in its scholastic form was nominalism, which held so exclusively to the reality of the individual as to make the essence or general nature a mere name or a thought in the mind. In modern philosophy, the notion of substance has been subjected to criticism in two directions. On the one hand, it has been asked how we are to think the relationship involved in it. Locke raised this question pointedly enough by his naive confession that he could see nothing in the conception of substance but 'a supposition, to which we accustom ourselves, of a support, we know not what,' for the qualities we perceive. On the other hand, it has been felt that the notion of substance is

a very inadequate and misleading one to apply to spiritual being or consciousness. In logic the converse of substance is attribute. The former is considered to be self-evident, while the latter can only be conceived as possessing a dependent existence. In theology attribute is much used to denote some characteristic of the Godhead—e.g. omnipresence. For modern problems in regard to substance, see part iii. of Hobhouse's *Theory of Knowledge* (1896).

Substitution, in Scots law, is to be carefully distinguished from conditional institution. If A by bequest leave movable property to B, whom failing to C, B—on surviving A—takes the property, and C has no claim to it, since he is merely a conditional institute. But if A dispose of heritable property to B, whom failing to C, and if B, who on surviving A takes the property, does not dispose of it by will or otherwise, the property, on the death of B, passes to C as the substitute.

Substitutions, THEORY OF, a branch of mathematics, which considers the results of substituting certain quantities or numbers belonging to a given set for an equal number of similar quantities or numbers belonging to the same set. For example, given any function of the four quantities x_1, x_2, x_3, x_4 , we get a new function if we substitute 2 for 1, 3 for 3, 4 for 2, and 1 for 4. Let us represent this substitution by s , then by successive applications of the substitutions we find $s = 2, 4, 3, 1$; $ss = 4, 1, 3, 2$; $sss = 1, 2, 3, 4$. Hence the substitution s is such that $s^3 = 1$. Now, whatever be the number of letters involved, and whatever be the substitution, it is found that a sufficient number of repetitions of s leads to the original arrangement, and that consequently s satisfies an equation of the form $s^n = 1$. The smallest number n which satisfies this equation is called the order of the substitution. In the case just given, the three quantities represented by 1, 2, 4 form what is called a cyclic substitution; and a little consideration will show that any substitution must be composed of a definite number of cyclic substitutions. Thus the substitution which transforms

$a, b, c, d, e, f, g, h, i, j$
into
 $d, j, i, e, h, c, b, a, f, g$
is built up of the cyclic substitutions (*adeha*) (*bjgb*) (*cifc*). Evidently the order of a cyclic substitution is simply the number of letters involved in the cycle; and the order of any substitution is consequently equal to the least common multiple of the orders of its component cycles. This method has important developments and applications in

the theories of numbers, of groups, and of equations. The most familiar substitution is that known as the linear substitution, in which a transformation is effected by putting in place of each variable or independent unit in an algebraic expression linear expressions involving the other variables or units. Such a substitution leaves the order of the algebraic expression unaltered. It has one of its most important applications in the ordinary analytical theory of curves and surfaces, and especially in projective geometry. See Petersen's *Théorie des Equations Algébriques* (French trans. by Laurent, 1897); Jordan's *Traité des Substitutions* (1870), Netto's *Substitutionentheorie* (1882), and Burnside's *Theory of Groups of Finite Order* (1897).

Subtropical Gardening is concerned with the production of effects similar to that of tropical vegetation, largely by the use of tropical plants. Such plants usually require the protection of glass during the winter months. Recesses in shrubberies or in banks clothed with foliage form the most fitting background for beds or groups to nestle in. Avoid Musas and Caladiums, the leaves of which tear to shreds if winds cannot be shut out, and also plants that look unhappy after a cold night or two. Make the most of plants that grow under nearly all conditions, and use any dell overhung by trees for half-hardy, fine-leaved plants. Among suitable plants are *Alsophila australis*, *A. excelsa*, *Dicksonia antarctica* and other tree ferns, *Bambusas*, *Arundinarias*, *Fatsias*, several species of *Ficus*, *Phormium tenax*, pampas grass, *Chamaerops humilis*, *Livistona chinensis*, *Ptychosperma cunninghamiana* and other palms, *Cannas*, *Zeas*, and *Solanums*.

Subways, in large cities, are now frequently constructed under the footways of streets to contain telegraph wires, electric-light cables, and gas, water, and compressed-air pipes. The provision of these subways, which are of sufficient size for a man to walk in, and are supplied with inspection openings at intervals, obviates the necessity for breaking up the streets whenever repairs are required to the pipes or cables underneath. Paris has been thus provided since the reconstruction of the city under Napoleon III.; and the newer thoroughfares in London—Southwark Street, Queen Victoria Street, and the Thames Embankment—have each an arched passage under the footway for this purpose. That under the Thames Embankment is 9 ft. wide, and 7 ft. 3 in. in height. Subways are

also made for passenger traffic between neighbouring railway stations, as that leading from King's Cross, Great Northern Railway terminus, to the station of the Metropolitan and District Rys. in London. Another development aims at avoiding the congested traffic of a street-crossing—e.g. that opposite the Mansion House in the City of London; while the more extensive subway which forms a hitherto unrealized part of the Strand improvement scheme seeks to relieve this traffic by carrying the cross stream (to and from Waterloo Bridge) under the current of the main thoroughfare. Three subways have been constructed under the Thames, two for foot-passengers only, and a third, the Blackwall tunnel, for vehicular traffic also. The Tower subway, now disused as a footway, has an internal diameter of 7 ft., and was constructed in 1869-70; the Blackwall tunnel, of 25 ft. diameter, in 1892-7; and the Greenwich subway, of 11 ft. diameter, has only recently been completed. The last named has a length of 1,217 ft. between the two shafts, which are sunk, in the Isle of Dogs and in Greenwich, to respective depths of 44 ft. and 50 ft., and which contain circular staircases and lifts. The subway descends from each side at a gradient of 1 in 15 to a central, almost level, portion of about 600 ft. in length. It is lined with cast-iron segmental plates, bolted together so as to form a continuous ring, and faced with white glazed bricks on concrete. The whole of the tunnelling was done, under compressed air, by means of the shield system. The cost of the work has been about £50,000, as compared with £10,000 for the Tower subway and £871,000 for the Blackwall tunnel. The expensive approaches which form a part of the latter scheme are of course unnecessary for a subway for foot-passengers only. The problem of transportation in New York is being solved by a system of parallel north and south subways, with occasional cross-lines connecting with tunnels under the Hudson R. and the East R. Electric traction by means of the third-rail system is exclusively used.

Succession. Intestate succession to land is in Scotland governed by different principles from succession to movable property. In both classes of property it follows the lineal, collateral, and ascending lines in the order named, but in succession to land the following principles operate, which are unknown in succession to movables—(1) primogeniture among male heirs; (2) common law right of representation, by

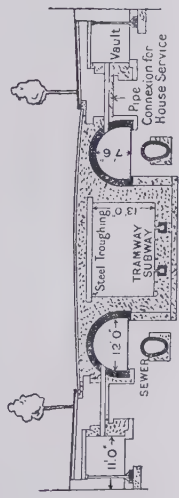
which a person succeeds as representing a deceased ascendant; (3) mother has never in any event claim to heritable succession; (4) father has no claim in preference to brothers and sisters. Representation has been to some extent introduced into movable succession, but is strictly confined within the statutory limits. See DISTRIBUTION, STATUTES OF.

Succession, APOSTOLIC, a term applied to the uninterrupted succession of the three apostolic orders—bishops, priests, and deacons—in the church by an unbroken chain of ordination from the apostles, and therefore from Jesus Christ, down to the present day. Through this uninterrupted succession of ordination the ministry so ordained claims to be invested with all the powers and privileges of the apostles, and therefore represents directly the Lord Himself. This view, founded on such passages as Matt. 18 : 18, is maintained by the Greek, Roman, Oriental, and Anglican Churches, who further hold that this is capable of historical proof, and is essential to the transmission of valid orders in the church. Other religious bodies, such as the Presbyterians and nonconformists generally, hold that no such special significance attaches to the passages referred to, and maintain that the rise of the sacerdotal caste did not take place until the 4th century. See Hatch's *Organization of the Early Christian Churches* ('Bampton Lectures,' 1880), Lightfoot's *Philippians* (1868), and C. Wordsworth's *Theophilus Anglicanus* (1843).

Succession Acts, regulating the succession to the English throne, were passed in relation to Henry IV., Henry VII., and the successors of Henry VIII. Parliament also passed acts of acknowledgment of the rights of James I., Charles I., and Charles II. After the revolution an act confirmed the crown to William and Mary, and dealt with the succession of Anne, providing that the Protestant line of sovereigns should be preserved, and enacting that all who occupied the British throne should belong to the communion of the Church of England as by law established. The right of Parliament to regulate the succession is secured by 6 Anne, chap. 7.

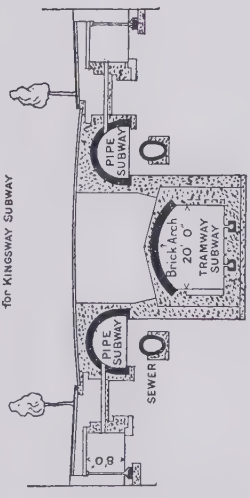
Succession Duty. See DEATH DUTIES.

Succinic Acid, (CH₂COOH)₂, a dibasic acid occurring in amber and other resins, from the former of which it can be obtained by distillation, though it is more easily prepared by the fermentation of calcium malate. It can be obtained synthetically by the hydrolysis of ethylene cyanide, and forms monoclinic crystals

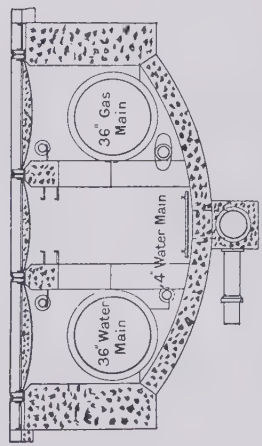


KINGSWAY SUBWAY High level Tramway

Scale of 1" = 10' Feet

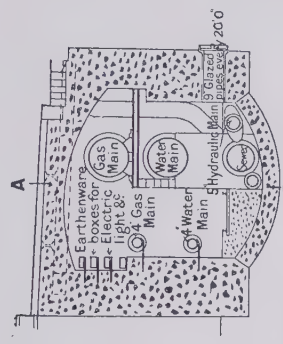


KINGSWAY SUBWAY Low level Tramway

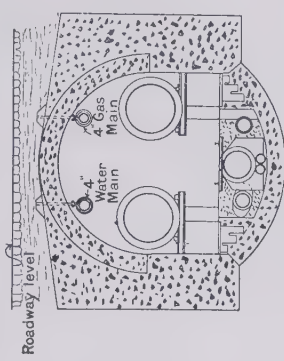


SUBWAY UNDER A TRAMWAY

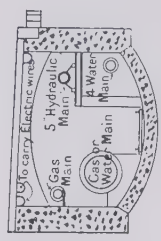
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SUBWAY FOR PIPES, under PAVEMENT

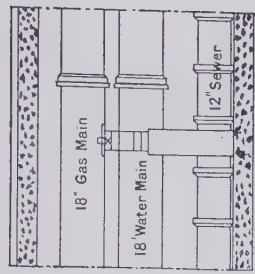


SHALLOW SUBWAY under a ROADWAY

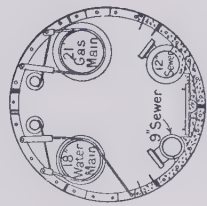


SUBWAYS under PAVEMENTS

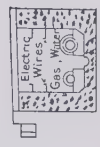
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SECTION on A.B.



DEEP SUBWAY under a ROADWAY



with a disagreeable taste. It melts at 180° C., is somewhat soluble in water, and forms a series of salts, of which the insoluble buff-coloured ferric succinate is made use of as a test for the acid.

Succubæ. See DEMONOLOGY.

Succulent Plants are of widely differing orders and habits, and include the Sedums, Sempervivums, Mesembryanthemums, Agaves, Aloes, Gasterias, and Mammillarias. By virtue of the large quantity of water which they contain, succulent plants are usually able to withstand considerable drought.

Su-chau, or SOOCHOW, city, prov. Kiang-su, China, 55 m. w. of Shanghai, on Grand Canal, in the heart of the silk district, one of the wealthiest cities in China; was almost destroyed in the Tai-

wrote *Mémoires sur ses Campagnes en Espagne de 1808 à 1814* (1829-34). See Barault-Rouillon's *Le Maréchal Suchet* (1834) and Choumara's *Considérations Militaires sur les Mémoires du Maréchal Suchet* (1840).

Sucker, a shoot (apart from the main shoot) of a shrub or tree which takes its origin beneath the surface of the ground. The removal of suckers is often of great horticultural importance, especially in the case of fruit-trees and rose-bushes.

Sucking-fish, or SUCKER, names given to different varieties of fish. (1.) The species of *Eche-neis*, one of which is also called remora. This genus belongs to the mackerel family, and the special peculiarity is that the first dorsal fin is converted into an adhesive disc, which occupies the

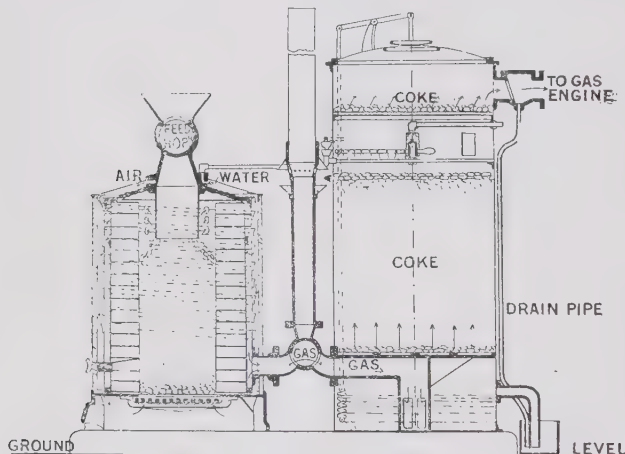
marine, sucker-bearing fishes, of which some are British. In this case the adhesive disc is ventral, being placed between the pelvic fins. In the south of Britain three species of *Lepadogaster* are common; they are pretty littlefishes, often called 'suckers,' and not infrequently kept in aquaria. These fish should not be confused with the lumpsucker and its allies, or with the gobies, which are also capable of attaching themselves to rocks by their modified ventral fins.

Suckling, SIR JOHN (1609-42), English poet, was born at Whithon, Middlesex. After 1628 he seems to have served in the army of Gustavus Adolphus. He returned to England in 1632, and became famous at the court of Charles I. for his wit and prodigality. In 1639 he raised a force of horse to aid the king against the Scots. Suckling became member of Parliament for Bramber in 1640; but having joined in the plot to rescue Strafford from the Tower in 1641, he had to flee to France. His chief compositions are *The Goblins*, *Aglaure*, and *Brennoralt*. Suckling's fame rests chiefly on his lyrics, among which are, *Why so pale and wan, fond lover?* and *I prithee send me back my heart*. See Life prefixed to the *Selections* by A. I. Suckling (1836), and Memoir prefixed to Stokes's ed. (1885).

Sucre, tn., Bolivia; since 1894 the capital, but recently the seat of government has been transferred to La Paz. Sucre is situated on the watershed between the basins of the Amazons (Guapay) and the La Plata (Pilcomayo). It is the residence of the archbishop of Bolivia, and contains a university. It was founded in 1539 by a companion of Pizarro, and was called Chuquisaca till the declaration of independence. Pop. 22,000.

Sucrose. See SUGAR.

Suction Gas plants are devices by which producer-gas, suitable for use in gas-engines, is prepared by drawing air through red-hot coal by the suction of the piston of the engine itself. The advantage of the method is that the quantity of gas made is dependent solely on the amount required by the engine, and as the pressure inside the apparatus is lower than that of the atmosphere, leakage of this somewhat dangerous gas cannot occur. An example of such an apparatus, known as the Watt suction gas-producer, is shown in the accompanying illustration. The generator, on the left, has a double case; and the gas, which is generated by passing a mixture of steam and air up through the incandescent material, passes down an inner annular space to the washer on the

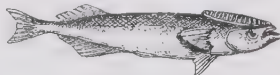


Suction Gas-Producer.

ping rebellion, but has since largely recovered. It was opened to foreign trade in 1896. Pop. 500,000.

Suchet, LOUIS GABRIEL, DUC D'ALBUFERA (1770-1826), French soldier, born at Lyons. He distinguished himself in the Italian campaigns of 1796 and 1799-1800, in the latter of which he was second in command to Masséna. At Marengo, and in the great engagements of 1805-7—Austerlitz, Saalfeld, Jena, Pultusk, Ostrotenka—he ably assisted Napoleon. Named governor of Aragon, he inflicted defeats on the British under Blake (1809) and under O'Donnell (1810), and conquered Valentia (1812). Created count (1808) and marshal of France (1811), after the abdication of Napoleon he was made Duc d'Albufera by Louis XVIII.; but Suchet was involved in Napoleon's fall after Waterloo. He

upper side of the head and neck. The disc consists of a double series of transverse lamellæ, which can be erected, and by the production of a series of vacuums enable the fish to attach itself very firmly to any flat surface. Remoras usually fasten themselves to moving objects, such as other fish, especially sharks, tur-



Sucking-fish (Echeneis remora).

tles, ships, and so on. Sucking-fishes occur in all seas, and there are about ten species. The best-known species are *E. remora*, growing to about eight inches, and *E. nautraces*, a slender form which attains three feet. (2.) The family of *Gobiescoideæ* includes a considerable number of small

right. In this apparatus the gas is washed in passing up through a column of coke. See GAS MANUFACTURE.

Suctorior, an order of Infusoria, including fresh-water and marine forms. In the young stage the Suctorior are uniformly covered with cilia, but in the adult condition they bear instead stiff rodlike processes, often knobbed at the tip, which are called tentacles. By means of these the animals are able to suck out the contents of their prey, which usually consists of ciliate Protozoa. Suctorior are all sedentary in habit. Examples are *Acineta* and *Dendrosoma*. See PROTOZOA, INFUSORIA.

Sudan, or **BILAD-ES-SUDAN** ('Land of the Blacks'), includes a large belt of Africa S. of Egypt and the Sahara. The French Sudan is the country of Upper Senegambia and the upper Niger,

the British and Egyptian governments. The Nile, called above the mouth of the Bahr-el-Ghazal the Bahr-el-Jebel, and the Bahr-el-Abiad or White Nile thence to the junction with the Blue Nile at Khartum, traverses the country for a distance of nearly 2,000 m., and is obstructed by five cataracts between Khartum and Wady Halfa. This northern part of the Sudan is mostly desert, with small tracts of pasture here and there; and cultivation is confined to the river banks, for the rainfall is very scanty. Ranges of hills rise near the river to about 3,500 ft., and near Suakin are peaks fully 5,000 ft. high. South of Khartum the tropical rains gradually increase. Kordofan, a table-land rising to 2,000 ft., the hilly Dar Nuba, and Darfur, with summits of 6,000 ft., receive a fair quantity of rain in the wet season, but at other

are of the same race. The Hamites, or Bijas, include the Ababdeh, Bisharin, and Hadendos, nomad traders celebrated for their camels. The Gararish, Hauwawir, and Jaalin are of Arab origin, as are also the Baggaras of Kordofan, the chief warriors of the Mahdi. On the upper Nile, Sobat, and Bahr-el-Ghazal dwell uncivilized negroes—the Shilluk, Nuers, Dinkas, Bongo, Jurs, etc. The total population of the Sudan is supposed to be between one and a half and two millions. The capital is Khartum. Durra (*Sorghum*), doko (*Penicillaria*), and sesame are grown in all parts, and yams, bananas, and groundnuts in the south. A little wheat and barley are raised in Kordofan, Darfur, and along the lower Nile. A small quantity of cotton is grown in the Bahr-el-Ghazal, Darfur, and Kassala, and efforts are being



The Sudan.

and the country east of the Niger is often spoken of as the Central Sudan; but at the present time the Egyptian Sudan is the only political division properly distinguished by the name. It extends over the Nile basin from Wady Halfa nearly to Gondokoro on the upper Nile, and borders on the Red Sea. In 1819 Mehemet Ali of Egypt sent his son Ismail to annex Nubia; and in subsequent years Egyptian rule was extended, chiefly by the efforts of Baker, Gordon, and other Europeans, to the Albert Nyanza and the watershed of the Bahr-el-Ghazal. In 1882 Mahdiism broke out, and the last Egyptian governor, Emin Pasha of the Equatorial Province, was rescued by Stanley in 1889. Nine years later the reconquest of the country was practically completed by Lord Kitchener at the battle of Omdurman (1898), and the following year the Sudan was constituted a condominium of

times suffer from drought. On the other side of the Nile, on the plains of the Atbara and the Blue Nile, very similar conditions prevail; but the soil is very fertile, and the area of cultivation might be much extended by irrigation. The banks of the Bahr-el-Jebel and Bahr-el-Ghazal are low, the fall is slight, and the rainfall large (124 in.), and consequently the country is swampy. The latter river and its tributaries converge like a large fan from the watershed, which, running N.W. from the Albert Nyanza, sinks from 6,000 ft. to about 2,500 ft. near Dem Ziber. The northern part of the Sudan is occupied by Moslems of negro (Nuba), Hamitic, and Arab race, some tribes being of such mixed blood that they cannot be classified. The most noted Nubian tribe is the Dankala, or Danakil, of Dongola, to which the Mahdi belonged, and the settled peoples of Kordofan, Darfur, and Sennaar

made to produce it in Sennaar and Kassala for export. The latter district also produces coffee. Camels, cattle, zebu, sheep, and goats are the domestic animals. Gazelles roam the deserts, and large beasts of prey are numerous; there are also crocodiles and hippopotamuses. A little ivory and a few ostrich feathers are exported. Iron is worked by the natives in the Bahr-el-Ghazal and in Darfur. Railways run from Wady Halfa to Khartum (575 m.), and from Berber to Port Sudan, 30 m. N. of Suakin (opened 1906; 325 m.). Up stream the Nile is navigable by steamers to Gondokoro (1,130 m.); but the Bahr-el-Jebel is liable to be blocked by *sudd*—masses of papyrus and grasses—and therefore the excavation of a new channel has been suggested. The Blue Nile is free to the cataracts of Roseires, about 400 m. from Khartum; the Sobat to the boundary near Nasser, 170 m. from its mouth; and the

Bahr-el-Ghazal to Meshra-er-Rek, 150 m. from Lake No.

See Ward's *Our Sudan: its Pyramids and Progress* (1905); Lady Lugard's *A Tropical Dependency* (1905); and *The Anglo-Egyptian Sudan*, a compendium prepared by officers of the Sudan

by Flemings in the 14th century. Silks, velvets, and coco-fibre matting are made, and there are breweries and lime works. Gainsborough, the artist (1727-88), was a native. Pop. (1901) 7,109.

Sudbury, vil., Algoma dist., Ontario, Canada, 210 m. N.N.W.

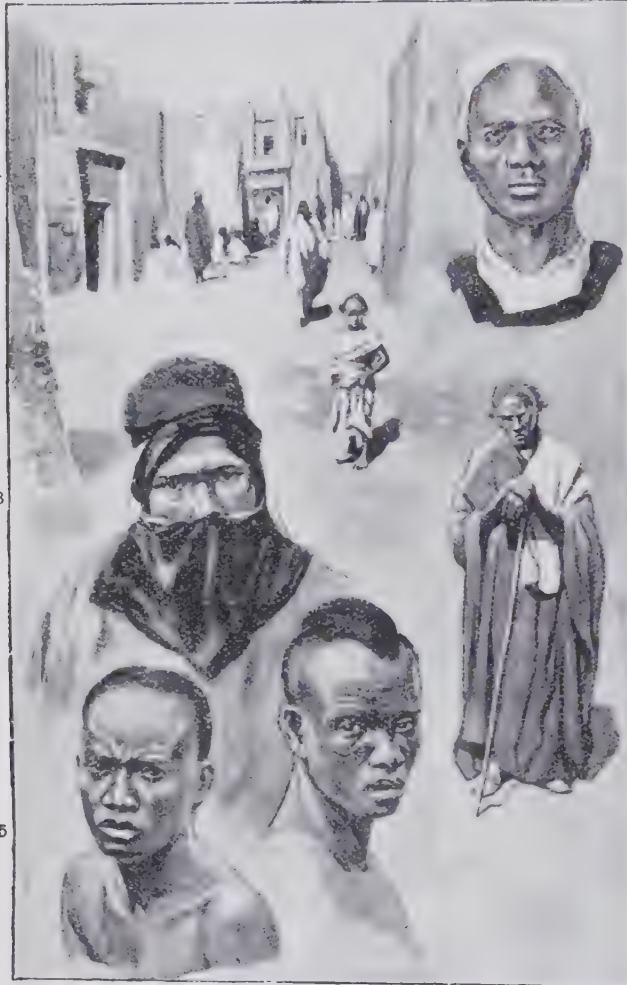
born at Matziken in E. Prussia; first attracted attention by the somewhat realistic play of *Die Ehre* (1890). This was followed by the plays *Sodoms Ende* (1891); *Heimat* (1893; Eng. trans. *Magda*, 1896); *Schmetterlingsschlacht* (1895); *Johannes* (1898); *Die Drei Reiterfedern* (1899); *Johannisfeuer* (1900); *Es lebe das Leben* (1902; Eng. trans. *The Joy of Living*, 1902); and *Der Sturmeselle Sokrates* (1903); and by the novels *Frau Sorge* (1887; Eng. trans. *Dame Care*, 1892), which has gone through more than sixty editions; *Im Zwielficht* (1887); *Der Katzensteg* (1889; Eng. trans. *Regina*, 1898); and *Es war* (1894). All his books have been very popular. See W. Kawerau's *H. Sudermann* (1897).

Sudetic Mountains, mountain system, connects the Carpathians with the mountains of Franconia, and separates the basins of the Bohemian Elbe and the Moravian March from the Oder. It consists of short, broken, and somewhat parallel ranges, with a general S.E. trend, intersected by numerous valleys. The chief divisions are the Isergebirge, Riesengebirge (the highest), Glatzer, Moravian Gesenke, and Altvatergebirge. Minerals (iron, zinc, lead, copper, and coal) are abundant.

Sudras, the lowest of the four great classes into which the people of India were divided on the institution of caste. It included races of mixed blood and many of the aboriginal tribes who adopted Hindu customs, and now includes artisans, field-labourers, and menials. The races which continued outside the pale of Hinduism were 'out-castes' or Pariahs. But the superiority which Sudras, in some parts of India, claim over Pariahs is quite out of keeping with the degraded position assigned to them in Manu.

Sue, JOSEPH MARIE (1804-59), better known by his pen-name of Eugène Sue, French novelist, born at Paris; practised medicine for a time, pursuing literature in secret. At length he lighted upon the vein which has rendered him famous—viz. novels of the mysterious and supernatural, dashed with popular socialism. Of this type *Les Mystères de Paris* (1842), *Le Juif Errant* (1844-5), *Les Sept Péchés Capitaux* (1847-9), *Les Mystères du Peuple* (1848-9) are the most notable. After the French revolution of 1848 he represented (1850) Paris in the National Assembly until the *coup d'état* (1852) of Louis Napoleon, when, to avoid arrest, he retired to Savoy.

Succa, tn., prov. Valencia, Spain, 19 m. s. of Valencia. Pop. (1900) 14,435.



Native Types of the Sudan.

1. View in Timbuktu. 2. Mandingo. 3. Tuareg. 4. Fulani. 5. Haussa. 6. Dinka.

government, and edited by Count Gleichen (1906).

Sudbury, munic. bor., Suffolk, England, on Stour, 16 m. s. of Bury St. Edmunds. The churches of All Saints, St. Gregory, and St. Peter are all ancient. There are slight vestiges of a 13th-century Dominican friary. The town was formerly noted for its woollen manufactures, introduced

of Toronto, with nickel mines, discovered in 1883.

Sudd, a floating mass of vegetable matter that forms in the White Nile and obstructs navigation. In 1900-2 it was entirely removed, some of the blocks cut out being a mile long and twenty feet thick.

Sudermann, HERMANN (1857), German dramatist and novelist,

Suet, the solid fat obtained from sheep and cattle. It consists principally of the palmitates and stearates of glycerol, with some of the oleate and more or less connective tissue. If heated the fats melt, and can be run off, forming tallow. Margarine is obtained by more careful treatment at a lower temperature, followed by the removal of some of the higher melting components.

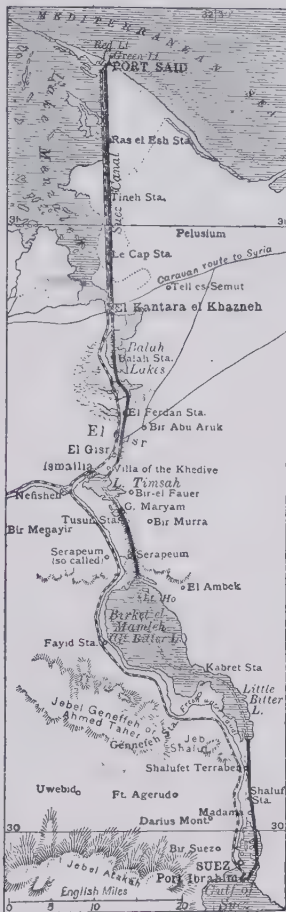
Suetonius, whose full name was GAIVS SVETONIVS TRANQVILLVS (c. 75-160 A.D.), Roman historian and friend of Pliny. He became chief secretary to the Emperor Hadrian. He wrote *Lives of the Twelve Cæsars*, *A Book of Famous Scholars*, another of *Famous Orators*, and *Lives of Terence*, Horace, Persius, Lucan, Juvenal, and Pliny the elder. The *Lives of the Twelve Cæsars* is chiefly a collection of anecdotes, largely of a scandalous nature, but it contains many valuable facts. His style is clear and unadorned. Editions by Hase (1828), Roth (1858); with Latin notes, Baumgarten-Crusius (1816). Eng. trans. by Philemon Holland (1606).

Suevi, Germanic people or confederation. Cæsar's Suevi inhabited the modern Baden, while Tacitus places them to the north and east of that region; either they had migrated between c. 50 B.C. and 100 A.D., or Cæsar only met a portion of the people. After 250 A.D. the name is used of the Germanic people, from whom the modern Swabians have derived their name. In later history they appear in alliance with the Alemanni and Burgundians, and hold the German side of Gaul and Switzerland, and even enter into Italy and Spain, in union with the Visigoths.

Suez, tn., Egypt, at s. end of Suez Canal. Once a flourishing emporium for Oriental trade, it fell into decay, and until the opening of the Suez Canal was a wretched village. The modern town is built on a desert peninsula. The European quarters are regularly laid out, and contain the large warehouses of the Peninsular and Oriental Steamship Company. Pop. 19,000.

Suez Canal connects the Mediterranean and the Red Sea. The first canal known was constructed by Seti I., and is pictured on the walls of the temple of Karnak. The first person who in modern times took up the subject of making a waterway between the two seas was Napoleon I., in 1798; but Lepère, the engineer whom he employed to survey the district, made out a difference of thirty feet between the levels of the Mediterranean at low water and the Red Sea at high water,

so the project was abandoned. In 1846 a commission, which included Stephenson, separated without any definite plan being formed. Mougél and Linant, two Frenchmen, in 1855 drew up a scheme, with M. Lesseps as their superintendent. In 1856 the scheme was submitted to an international commission, and the work was begun; and on Nov. 17, 1869, the canal was opened



Suez Canal.

for traffic. The cost was about £16,000,000. Between 1885 and 1889 the canal was enlarged and improved at a cost of £4,000,000, the result of which was to make a uniform depth of 29 ft., a width of 213 ft. in the straight parts and from 246 ft. to 262 ft. in the curves, and thus to enable ships of 10,000 tons to be navigated safely through. The total length of the canal is nearly 100 m., and the average time of transit is

about 16 hrs. 8 min. With the help of the electric light navigation can be carried on at night. In 1905 it was traversed by 4,116 ships, representing a total of 13,134,105 tons, of which 8,356,940 were British. The total receipts were £4,650,513, and the expenditure £1,620,780. In 1875 Lord Beaconsfield bought for the British government the shares held by the Khedive—amounting to nearly half the canal stock—for £4,080,000.

Sufficient Reason, a formulation of the principle of causality, associated specially with the name of Leibniz, who recognizes the principles of contradiction and sufficient reason as the two fundamental principles of all reasoning, and defines the latter as affirming (*Monadology*, sec. 32) 'that there can be no fact real or existing, no statement true, unless there be a sufficient reason why it should be so and not otherwise,' although, he adds, these reasons usually cannot be known by us. In the case of necessary truths the reason is discoverable by mere analysis, for their opposites would involve contradiction; but in the case of truths of fact we must seek the reason in other facts, and ultimately in the final reason or ground of all existence, God.

Suffocation. See ASPHYXIA, RESPIRATION, STRANGULATION.

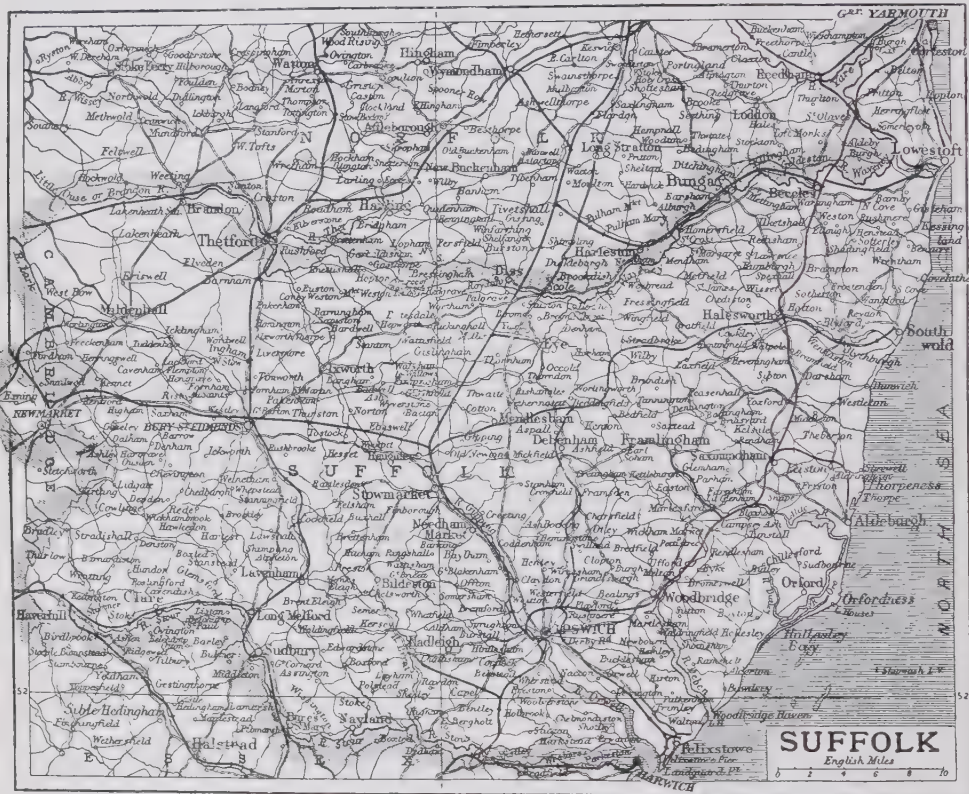
Suffolk, maritime co., E. England; coasts low, and much encroached on by the sea; surface low and undulating, traversed in w. by chalk ridge (highest, 352 ft.). Principal rivers are Waveney (Norfolk border), Blyth, Ore with Alde, Orwell, and Stour (Essex border). All, except Blyth and Alde-Ore, have wide lower courses. In the N.E. are broads (Oulton, Flixton, etc.) like those of Norfolk. In the N.W. is the Breckland district, with heath. On the coast are bathing resorts (Lowestoft, Southwold, Aldeburgh, Felixstowe). Coprolites, chalk, and clay are worked. Agriculture is the principal industry. Many sheep and swine are reared, as also turkeys, geese, and other poultry. The coast fishery (Lowestoft) is important. Manufactures include agricultural implements (Ipswich, Bury St. Edmunds, etc.); railway plant, engineering works, milling machinery (Ipswich); gun-cotton and cordite (Stowmarket); textiles (Ipswich, Haverhill, etc.); gun-flints (Brandon); artificial manures (Ipswich, Stowmarket, etc.). The county is divided for administrative purposes into E. and W. Suffolk, and returns five members to Parliament. Anciently occupied by the Iceni, it afterwards formed part of the Roman Flavia Cæsariensis and of the Saxon E. Anglia, and suffered

much from the Danish ravages. The Flemings, who settled here in the 13th century, developed the woollen industry. Antiquities include Burgh Castle, an important Roman relic; remains of Benedictine abbey at Bury St. Edmunds; castles of Framlingham and Orford; tumuli in several parts; many old mansions (Moyses Hall, Bury, 12th century); and numerous mediæval churches of flint and stone, with elaborately carved woodwork. Area, 948,728 acres. Pop. (1901) 373,353. See Coppen-ger's *County of Suffolk* (1904-5).

in England: Guildford (created 1888), Marlborough (1888), Richmond (1888), Shrewsbury (1888), Barrow-in-Furness (1889), Beverley (1889), Derby (1889), Reading (1889), Swansea (1890), Hull (1891), Colchester (1894), Crediton (1897), Dover (1898), Islington (1898), Ipswich (1899), Barking (1901), Kensington (1901), Sheffield (1901), Stepney (1901), Leicester (1903), Southampton (1903), Thetford (1903), Croydon (1904), Burnley (1905), Dorking (1905), Grantham (1905), Woolwich (1905), and Kingston (1905).

state (1883-7), Wyoming (1890), New Zealand (1893), S. Australia (1894), New South Wales, W. Australia, Queensland, Tasmania, and the Commonwealth of Australia (1902). Under greater or less restrictions, women enjoy the franchise also for phases of local government in England, Norway, and Connecticut, in addition to the states already mentioned. See Gage's *History of Woman Suffrage* (1881-7); also ELECTIONS.

Suffren, PIERRE ANDRÉ DE SUFFREN SAINT-TROPEZ, BAILLI



Suffolk, CHARLES BRANDON, DUKE OF (d. 1545), was created Viscount Lisle in 1513, and Duke of Suffolk in 1514, and was a courtier, soldier, and favourite at the court of Henry VIII., whose sister Mary, widow of Louis XII. of France, he secretly married (1515).

Suffragan. Originally all provincial bishops under a metropolitan were called his suffragans. An act of Henry VIII. provided for what were termed 'suffragan bishops,' for the supplementing of the work of the dioceses. The following places are suffragan sees

Suffrage, FEMALE. Women were disenfranchised by the Reform Bill of 1832. In 1867 Parliament rejected a motion by J. S. Mill to allow women to vote at parliamentary elections, and annually, from 1870 till 1892, Women's Disabilities Removal Bills and Women Suffrage Bills have been introduced in Parliament and rejected. Under the Local Government Act, 1888, the right to vote in local affairs was granted to female ratepayers. Female suffrage was granted in Massachusetts (1879), Washington

DE (1729-88), French admiral, was born in Provence; fought against the British fleet at Toulon (1744) and Cape Breton (1746), and was captured in the Bay of Biscay. On his release he spent some years with the Knights Hospitaliers of Malta; but having rejoined the French navy, he fought in the engagement of Minorca, was again captured in the naval battle in which Admiral Boscawen annihilated the French fleet (1759), and was a prisoner in England until peace was made (1763). He next administered severe punish-

ment to the Sallee rovers; then helped to blockade Gibraltar. Proceeding to the E. Indies, he captured Trincomali, and fought two drawn battles with the British fleet off the coast of India.

Sufism, a movement of revolt against the rigid law and wearisome ritual of Mohammedanism in Persia. It finally crystallized into a pantheistic mysticism which, tinged by the teachings of Zoroaster, adopted also something of the Buddhist theory of life. But a wide gulf separates the Buddhist from the Sufi. While the former owns no deity and no soul, the latter acknowledges the existence of both. Each system has for its end the absorption of the human into the divine; but while the Buddhist seeks in mental abstraction a complete cessation from thought and sense, the Sufi aspires to a growing acquaintance with God, such as will culminate in ecstatic devotion to the Divine Being—a love which will so envelop the soul as to dispel all inferior affections and desires. This consummation is reached by five stages: (1) service—obedience to the law of God; (2) love—the attraction of the soul to God; (3) seclusion—meditation on divine things; (4) knowledge—metaphysical studies on the nature and attributes of God; and (5) ecstasy—the excitement produced by a full comprehension of divine love and power. The Sufi contends that no definition can convey to the uninitiated the esoteric meanings attached to these five stages in the progress of the soul. Sufism has inspired nearly all the best poetry of Persia.

Sugar, a term applied generically to a number of sweet-tasting, polyhydric, aldehyde or ketonic alcohols, such as dextrose and levulose, and their anhydrides, such as cane sugar, which form a considerable section of the class of compounds known as carbohydrates. The name is also used particularly, and to a greater extent, to specify one member of that class, cane sugar, which is of the chief commercial and domestic importance. In this article cane sugar alone will be considered, the general relations of the sugars being dealt with in the articles on carbohydrates, and on the specific sugars such as fructose, dextrose, etc.

Cane sugar, sucrose, or saccharose is a compound of the formula $C_{12}H_{22}O_{11}$, and though called 'cane' sugar, it occurs also in other plants, as the maple and sorghum, and is now chiefly obtained from the sugar beet: the product from all these sources is identical. In the preparation from sugar cane, which contains about 15 per cent. of sugar, the

cane is crushed between rollers to remove the juice, which, after treatment with sulphur dioxide and neutralization with lime to prevent fermentation, is heated, skimmed, and evaporated. The evaporation is carried out either in open or vacuum pans, or in mechanical evaporators, in which steam pipes are alternately dipped into the juice and exposed to the air; and according to the process, the product may contain uncrystallizable syrup, which is removed by draining or in centrifugal machines; or it may be solid enough to pack for export and refining without requiring such treatment.

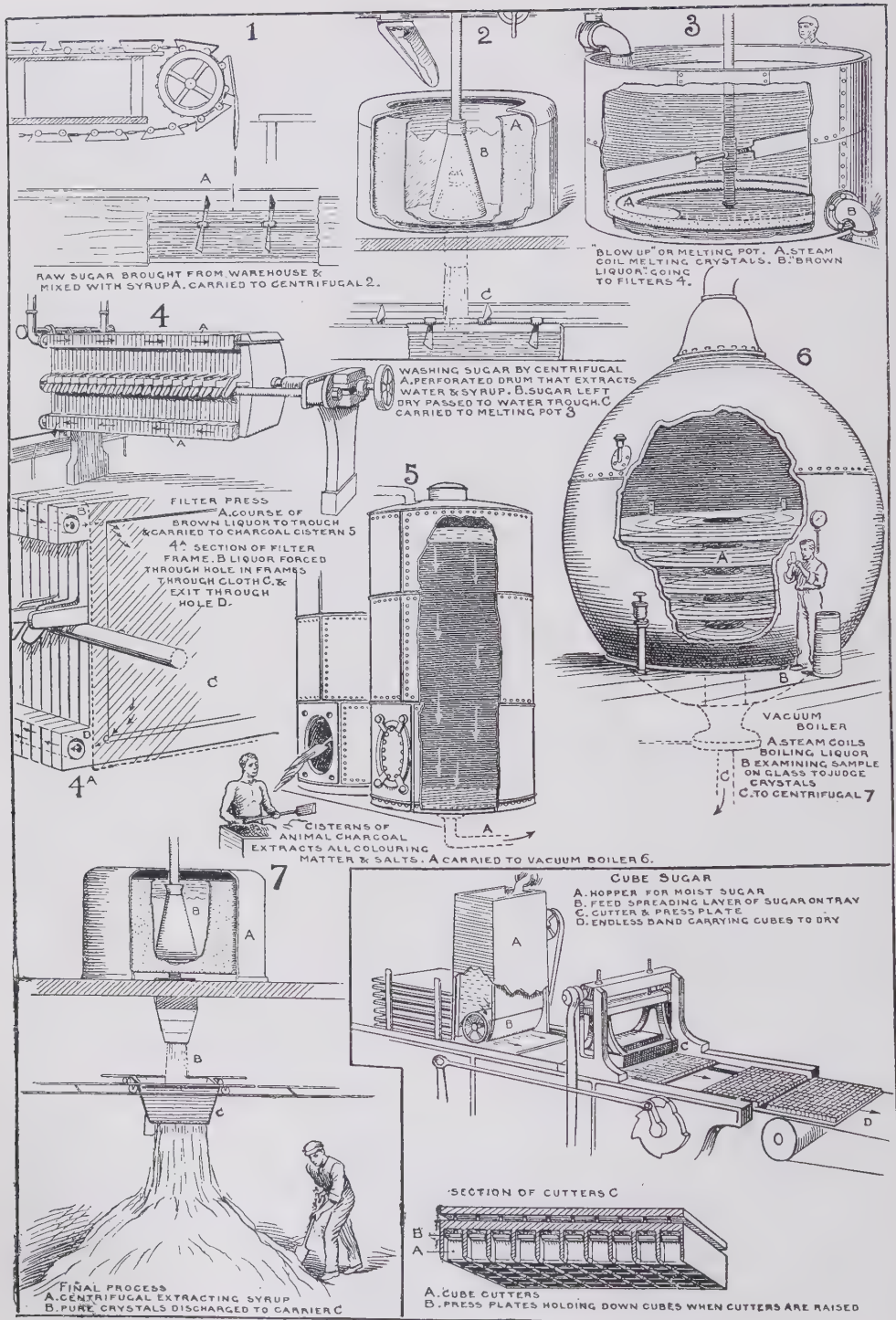
Sugar is extracted from the beet by an entirely different process. When sliced beetroot is suspended in warm water, the sugar diffuses through the walls of the cells of the plant into the water. This operation is carried out systematically in a series of 'diffusers,' arranged in a circle, so that the nearly exhausted cuttings are treated with fresh water, the sugar solution as it gets richer coming in contact with fresher and fresher cuttings. Instead of a series of separate vessels, the process is sometimes carried out continuously, a stream of cut beet being forced in the opposite direction to a stream of heated water or solution. The exhausted cuttings are finally used as cattle food. The juice is treated with lime, heated, and then acted on by carbon dioxide. The object is not only to neutralize acids present, but also to clarify the juice; the precipitate of chalk which is formed carries down the impurities. After filtration the juice is evaporated at low temperature, at first in a series of multitubular vessels, in which the vapours from one vessel go to evaporate the liquor in another at a lower pressure; and then after a brief heating at atmospheric pressure the evaporation is completed in steam-heated vacuum pans, and the crystals in the product are separated from the uncrystallizable syrup in centrifugals.

The product from both sources is purified by much the same process. The raw sugar is first dissolved in hot water, and the solution filtered through cotton bags, suspended from nozzles in iron chambers, to remove insoluble impurities. The brown liquor is then run into iron cylinders packed with 'char'—i.e. bone charcoal—and allowed to remain till decolorized, when it is slowly drawn off from below. The purified sugar liquor is then boiled down in steam-heated vacuum pans at a temperature of 82° C., more syrup being added to fill up the pan as soon as crystallization sets in. After a sufficient amount of

crystals have formed the mixture of crystals and syrup, or 'massecuite,' is run off into centrifugals, by which the syrup is separated from the crystals, which are washed in the machine with a spray of water, spread out to dry, and packed. The syrups are reboiled, yielding a lower grade of sugar, the final residue being converted into golden syrup, or in the case of beet worked up to yield the crystallizable sugar they still contain. Loaf or cube sugar is made by filling the massecuite into moulds, washing out the syrup with pure sugar liquor, draining, and finally cutting into suitably sized small pieces.

The syrups obtained in refining beet sugar are treated by several processes, both mechanical and chemical. In the osmose process the syrup is diffused into water through parchment paper, which allows the salts that hinder crystallization to pass through more rapidly than the sugar and other organic compounds present. After a sufficient treatment the syrup left is reboiled. The syrup from which sugar can no longer be profitably obtained is either fermented to convert it into alcohol, or worked up for the salts present.

Cane sugar dissolves in one-third part of cold water and far less hot. It does not reduce Fehling's solution or ferment until 'inverted'—i.e. hydrolyzed into equal numbers of molecules of dextrose and levulose. Its aqueous solution rotates the plane of polarized light to the left—a property that is largely made use of in 'saccharimetry,' or the estimation of the amount of sugar. Cane sugar melts at 160° C., solidifying on cooling to a glossy mass known as barley sugar; whilst at a higher temperature it changes into a dark-brown product called caramel. Cane sugar is valuable as a sweetening agent to render other foods palatable and attractive, and though it is not sufficient by itself, it forms a very useful component of foods, being easily soluble and assimilable. It is rarely adulterated; loaf sugar is almost chemically pure, and, in fact, the only common addition is that of colouring matter to make colourless crystals resemble Demerara sugar. The world's production of sugar in 1905 amounted to 9,732,000 tons, more than half being beet sugar. The imports into the United Kingdom were—refined sugar, 581,976 tons; unrefined, 559,800 tons. See M'Intosh's *Technology of Sugar* (1903), Lock's *Sugar Growing and Refining* (1882), Decr's *Sugar and the Sugar Cane* (1905), and Roth's *Guide to the Literature of Sugar*.



Sugar-refining. (Sketches at Messrs. Abram Lyle & Sons, Ltd., Silvertown, London.)

Sugar Bounties Conventions.

An international conference was held in London in 1887 to consider the effect of bounties on the manufacture of sugar. Representatives were present from Britain, Germany, France, and Austria. The bounty system was then condemned in theory. The bounties were, however, too profitable for continental sugar-growers to yield to argument, and another international conference was held at Brussels on June 7, 1898. This was adjourned till Dec. 16, 1902. It was then decided that the bounties should be abolished in September 1903, and that the maximum of the surtax should be limited.

Sugar of Lead. See LEAD.

Suhl, tn., Prussia, prov. Saxony, picturesquely situated on S. side of Thuringian Forest, 13 m. E.N.E. of Meiningen. It has been famous since the 15th century for its manufacture of guns and small arms; other industries—porcelain, machinery, and leather. Pop. (1900) 12,622.

Suhm, PEDER FREDERIK (1728-98), Danish historian; published *Historie af Danmark* in 24 vols. (1782-98), the last seven after his death by Kall and Nyerup (1806-28). It is rather an inexhaustible storehouse of facts and documents than a critical history. He succeeded Langebek as editor of *Scriptores Rerum Danicarum*.

Suicide is a form of murder (hence the term *felo de se*, 'murderer of himself'), and one who abets another in committing suicide is guilty of murder. A policy of insurance is void if the holder commits suicide, except in cases of temporary insanity. Attempted suicide, however, is not punished as attempted murder, but is a common law misdemeanour, punishable at quarters sessions by fine or imprisonment. Suicides may now be buried like other persons in the parish churchyard, but no clergyman of the Church of England may read the burial service. Formerly a suicide was buried in the highway with a stake through his body. In Scotland suicide is still theoretically followed by escheat of personal property. Attempted suicide is a police offence.

Suidæ. See PG.

Suidas, author of a Greek lexicon, of unknown date, but probably between 500 A.D. and 1150. Though uncritical in its methods and badly executed, it is valuable for the literary history of antiquity, the explanation of rare words, and its many quotations. Editions by Gaisford (1834) and Bernhardy (1834).

Sui-fu, or HSU-CHAU-FU, tn., China, on the Yangtse-kiang, at the confluence of the Min-ho, 150 m. W.S.W. of Chung-king. It has

salt and coal mines, and a large trade with Yün-nan. Pop. 250,000.

Sui Juris. A person is said to be *sui juris* when he can enter into a binding contract—i.e. is not an infant or a lunatic.

Suir, riv., Ireland, rises in Devil's Bit Mountains, Tipperary, flows generally S. to border of Waterford, where it bends N.E. and then E., forming the northern boundary, and joins the Barrow with Nore in Waterford Harbour. Length about 100 m.

Suite, a species of instrumental composition which in its earlier forms had its first movement in the nature of a prelude and its others founded upon ancient dance rhythms. In modern orchestral suites, also in those for solo instruments, dance rhythms are less frequently employed.

Suja, tn., Kursk gov., Central Russia, 54 m. S.W. of Kursk city, with flour mills, distilleries, manufactories of pottery, saltpetre, candles; iron works, and market-gardening. Pop. (1897) 12,856.

Sukkar, tn., Shikarpur dist., Sindh, India, 48 m. S.E. of Jacobabad, with trade in silk, cotton, wool, opium, and piece goods. Pop. (1901) over 30,000.

Sulaiman Hills, which once formed the boundary between Afghanistan and India, run from north to south, parallel to the Indus. The following four towns mark the position of the more important passes:—Attock, where the Kabul joins the Indus; Dera Ismail Khan, close to the Khyber Pass; Dera Ghazi Khan; and Sukkur. The length of the range is 350 m., and the highest peak is Takht-i-Sulaiman, or Throne of Solomon (11,295 ft.).

Suleiman Pasha (1838-92), Turkish general, learned the art of war in Montenegro, Crete, and Yemen, and was for some time instructor in the Military Academy at Constantinople, of which he became director. He gained honours against the Servians in 1876, and was the hero of the magnificent defence of the Shipka Pass against the Russians in 1877. He then acted as commander-in-chief of the army of the Danube. Defeated near Philippopolis, he was degraded and condemned to imprisonment. The Sultan, however, pardoned him, and he died at Bagdad.

Sulina, free port, Tulcea prov., Roumania, at mouth of Sulina branch of Danube, 42 m. E.S.E. of Ismail; is a grain transshipping centre. Pop. (1899) 5,611.

Suliot, an Albanian tribe living in the pashalik of Yanina (Epirus), whither they took refuge from the Turks in the 17th century. They fought bravely for Greek independence, many of them having previously settled in the Ionian Is. They belong

to the Greek Catholic Church, and speak Greek.

Sulla, a patrician family of the Cornelian clan at ancient Rome. (1.) LUCIUS CORNELIUS SULLA (138-78 B.C.), who called himself 'Felix,' was quaestor in 107 B.C., and distinguished himself under Marius in Africa, when he captured Jugurtha. He did good service with Marius and Catulus against the Teutones and Cimbri in 102 and 101. In 93 he was prætor; in 92 governor of Cilicia. Soon after his return to Rome the social war broke out, and Sulla defeated the insurgents in Campania and Samnium, took Bovianum (89), and was elected consul for 88 B.C. At this time Marius and Sulpicius revolted against the senate, and Sulla marched to Rome, put Sulpicius to death, outlawed Marius and others, and re-established the power of the senate. He landed in Epirus in the summer of 87 to prosecute the war against Mithridates, and overthrew his generals at Chæronea (March 86) and at Orchomenus in 85; Athens had fallen in March 86. After settling the affairs of Asia, Sulla, early in 83, landed at Brundisium in Italy. Then he defeated one consul, Norbanus, while the army of the other, Scipio, deserted to him. In 82 he moved on Rome, won the decisive battle of the Colline Gate, outside the walls of Rome, and before long all Italy submitted to him. Sulla then set himself to extirpate his political opponents of the democratic faction by proscriptions, executions, and confiscation of their property. As dictator (81-79) he curtailed the legislative powers of the assembly of the tribes; forbade tribunes to bring forward laws except with the approval of the senate; excluded ex-tribunes from higher offices, so as to discourage men of ambition from holding that office; re-enacted old laws enforcing an interval of two years between holding different magistracies, and one of ten between holding the same office twice; increased the number of prætors from six to eight, and of quaestors to twenty; and finally established the rule that magistrates should hold power in their year of office only at Rome, and then should, as prætors, proconsuls, and so on, govern the provinces, thus definitely severing civil and military authority. The power of the knights as an order was abolished; only senators were allowed to sit in the jury courts. The senate was automatically filled by the rule that the twenty annual quaestors should, after their year of office, have seats in the senate, and three hundred new members were admitted to the senate to fill vacancies, making its number

about six hundred. He voluntarily resigned power, and spent his last years in retirement at Cumæ. As a general Sulla was greater than any Roman except perhaps the elder Scipio before him and Cæsar after him. His disinterestedness, his contempt of power, and his cool, cynical confidence in himself win our admiration. (2.) **FAUSTUS CORNELIUS SULLA** (c. 88-46 B.C.), son of the dictator, went with Pompey to the East about 65, and in 63 was the first to scale the walls of the temple at Jerusalem. In 54 he was quæstor. He had married Pompey's daughter, and so took his side against Cæsar in the civil war. When the Pompeians were defeated at Thapsus, he tried to escape to Spain, but was captured and brought to Cæsar's camp, where the soldiers murdered him. (3.) **PUBLIUS CORNELIUS SULLA** (d. 45 B.C.), a nephew of the dictator; was accused of complicity in Catiline's conspiracies, defended by Hortensius and Cicero, and acquitted. In the civil war he took Cæsar's side, and with him commanded the right wing at Pharsalia in 48.



Sir Arthur Sullivan
(Photo by Emery Walker.)

Sullivan, SIR ARTHUR SEYMOUR (1842-1900), English musical composer, born in London. In 1854 he became a chorister at the Chapel Royal, studied under Goss and Sterndale Bennett at the Royal Academy, and from 1858-61 at Leipzig. His first composition of importance was music to *The Tempest* (Crystal Palace, 1862). His numerous brilliant dramatic works, which earned for him European fame, began with *Cox and Box* (1866); these, with the exception of his grand opera, *Ivanhoe*, are all in the nature of comic operas. His long association with Mr. W. S.

Gilbert in the production of the well-known series of operas beginning with *Thespis* (1871), followed among others by *Trial by Jury* (1875), *H.M.S. Pinafore* (1878), *Pirates of Penzance* (1879), *Patience* (1881), *Iolanthe* (1882), *Mikado* (1885), *Yeoman of the Guard* (1888), *Gondoliers* (1889), and *Utopia Ltd.* (1893), is an outstanding instance of successful collaboration. Many of his other compositions — oratorios, cantatas, anthems, part songs, hymn tunes, songs — are well known, his music being as much appreciated by the masses as by cultured musicians. He was principal of the National Training School for Music (1876-81), and was knighted in 1883. See *Lives* by Wyndham (1903) and Findon (1904).

Sullivan, BARRY (1821-91), English actor, was born of Irish parents in Birmingham. He made his début at Cork in 1837, and in 1852 played Hamlet at the Haymarket in London. He acted in America (1857-60) and in Australia (1861-6). See *Life* by R. M. Sillard (1901).

Sullivan, JOHN LAWRENCE (1858), American pugilist, born at Boston, U.S.A. This heavy-weight commenced his career as a fighter in 1880, and for a long time carried all before him; his great weight and strength and 'hurricane' style of attack enabled him generally to knock out his opponents in two or three rounds. He fought a draw with Charlie Mitchell in 1888, and was defeated by J. J. Corbett in 1892 after twenty-one rounds.

Sully, JAMES (1842), English psychometrist, born at Bridgwater, Somersetshire. For many years he lectured upon education in the College of Preceptors; was appointed (1892) Grote professor of the philosophy of mind and logic in University College, London. His chief works are *Sensation and Intuition* (1874), *Pessimism* (1877), *Illusions* (1881), *Outlines of Psychology* (1884), *Teachers' Handbook of Psychology* (1886), *The Human Mind* (1892), *Studies of Childhood* (1895), *Children's Ways* (1897), *Essay on Laughter* (1902).

Sully, MAXIMILIEN DE BETHUNE, DUC DE (1559-1641), was born at Rosny, near Mantes, and attached himself to Henry of Navarre in 1571. He was in Paris at the time of St. Bartholomew massacre, and escaped with difficulty. In 1594 he was made a member of the Council of State, and till the end of the reign was 'first minister' in all but name. His chief attention was given to finance, and he succeeded in substituting, as far as possible, direct collection of taxes by the state for the system of tax-farming that had pre-

viously prevailed. He paid off a hundred millions of livres, and, without placing additional burdens on the people, raised the income of the state from seven to sixteen millions. It was his belief that 'tillage and grazing were the two breasts of France,' and he discouraged industry. His *Mémoires* (1634-62) are full of untrustworthy matter. See Monographs by Dussieux (1837) and Chailly (1888).

Sully - Prudhomme, RENÉ FRANÇOIS ARMAND (1839), French poet, born at Paris. His first volume, *Stances et Poèmes* (1865), was warmly praised by Sainte-Beuve, and achieved an undoubted success. His characteristics are subtlety and elegance of thought, sympathy with the beautiful and noble, great rhythmic felicity, and power of happily wedding sound and sense. The best of his later works are *Les Épreuves*, *Les Solitudes*, *Les Destinées*, *Impressions de la Guerre*, *La France*, *La Justice*, *Le Bonheur*. He was elected a member of the French Academy (1881), and his *Œuvres Complètes* appeared in 5 vols. in 1882-8.

Sulphates. See SULPHURIC ACID.

Sulphides. See SULPHUR.

Sulphites. See SULPHUROUS ACID.

Sulphocyanates, SULPHOCYANIDES, or better, **THIOCYANATES**, are the salts of thiocyanic acid, HSCN, which can be obtained as a strongly acid aqueous solution by the action of dilute sulphuric acid on barium thiocyanate. It is best known in its salts, of which potassium thiocyanate, KSCN, is characteristic, and forms colourless, deliquescent, very soluble crystals. This compound was formerly prepared by fusing the cyanide with sulphur, but is now obtained from ammonium thiocyanate, a substance of similar properties contained in gas liquor, and prepared on the large scale by heating carbon disulphide with aqueous ammonia solution. Thiocyanates are used as a test for ferric iron, which yields a blood-red thiocyanate, as a reagent for the estimation of silver, and as a stage in one of the processes for manufacturing cyanides on the large scale.

Sulphonal, dimethyl-methane-diethyl sulphone, $(CH_3)_2C(SO_2C_2H_5)_2$, is prepared by the oxidation of acetone ethyl mercaptol, and forms colourless, odourless prismatic crystals that are only slightly soluble in cold water. It is used in medicine as a hypnotic, and has no depressing action on the heart, and leaves no objectionable after-effects.

Sulphonic Acid, HSO₃OH, a monobasic acid known only in its derivatives, particularly those

in which the hydrogen atom is replaced by an alkyl group or aromatic radical. The alkyl sulphonic acids are prepared by the oxidation of mercaptans, and are strongly acid, crystalline, hygroscopic solids, whilst the aromatic sulphonic acids are obtained by the action of concentrated sulphuric acid on the hydrocarbons and their derivatives, and are also crystalline solids. The sulphonic acids yield sulphonchlorides, sulphonamides, etc., and in the case of aromatic derivatives are frequently important steps in the preparation of synthetical compounds.

Sulphur, or **BRIMSTONE**, S, 32·06, is a non-metallic element, widely distributed in nature both in the free state and in combination. Elementary sulphur is found chiefly in volcanic districts. In Europe, Italy and Sicily are the chief sulphur-bearing regions, though it is also found in Iceland, Turkey, and Hungary. The United States and Japan have important deposits. In combination, sulphur occurs largely in pyrites, not only that of iron, FeS_2 , but also in cupreous and arsenical varieties. Sulphides of lead (galena), of zinc (blende), mercury (cinnabar), and antimony (stibnite) are also widely distributed, but like the numerous sulphates, such as gypsum (CaSO_4), selenite (SrSO_4), Epsom salts (MgSO_4), and heavy spar (BaSO_4), are not practical sources of sulphur. A heap of native sulphur, containing up to 2,000 tons, is made on sloping ground and partially walled round and covered with sulphur refuse. Some air-holes or chimneys are left, and at the lower side of the slope rough moulds for the reception of the molten sulphur are provided. When the heap is set on fire a part of the sulphur burns, giving out enough heat to melt the rest, which trickles down to the moulds; as much as two-thirds of the sulphur present is obtained in a successful operation. The processes of extracting sulphur by fusion by superheated steam, of distillation, and of extraction by a solvent, such as carbon disulphide, are also carried out, though only to a comparatively small extent. Sulphur is also obtained by heating pyrites, though the product is impure and the yield very poor; most of the sulphur from sulphides goes to make sulphuric acid. A portion of this sulphur is sometimes recovered from the waste of the Leblanc alkali process. (See **SODIUM**.) Crude sulphur is purified by distillation from iron retorts into brickwork chambers, in which, when cold, the sulphur vapour condenses as a fine powder known as 'flowers of sulphur,' but

as the temperature rises it is deposited in the liquid form. The latter is cast into thick sticks for sale as 'roll sulphur.'

Common sulphur is a pale yellow, odourless, brittle solid, that is insoluble in water but readily dissolves in solvents such as carbon disulphide, from which it crystallizes in rhombic octahedra. It is as a brittle opaque aggregate of minute crystals of the octahedral variety that sulphur usually appears in the market, and it is characterized by its very poor conducting power for electricity and heat. Octahedral sulphur melts at 115°C ., and prismatic at 120°C ., the liquid when near the melting-point being mobile and of golden yellow colour. On raising the temperature the liquid becomes dark red and increases in viscosity, so that at 250°C . the vessel containing it can be inverted without the sulphur running out. On still further raising the temperature, the sulphur becomes darker and liquid again, boiling at 446°C . to a brownish-red gas. If the sulphur is suddenly chilled, as by pouring into cold water, it passes into a third allotropic variety known as plastic sulphur, which is soft and springy like india-rubber. This form is insoluble in carbon disulphide, and changes in a few days into the brittle octahedral form. Flowers of sulphur, and 'milk of sulphur,' produced by precipitating solutions of polysulphides with acids, are probably not distinct forms, but only finely divided octahedral sulphur.

Chemically, sulphur enters into reaction easily; thus when heated it catches fire at a comparatively low temperature and burns in air or oxygen with a lilac flame, to form sharp-smelling and suffocating fumes of sulphur dioxide. Metals, such as iron, burn brightly when heated in sulphur vapour; whilst reaction with non-metals, such as iodine, carbon, and hydrogen, also readily takes place, the corresponding sulphides being formed. Boiled with solutions of potassium or calcium hydroxides, complex mixtures, chiefly composed of polysulphides, are formed. Sulphur is chiefly employed for the production of sulphur dioxide, for fumigation, for the manufacture of sulphuric acid, sulphites, etc., and as a component of gunpowder and pyrotechnic mixtures. It is also an excellent insulator, and when applied molten is used as a cement. In medicine it is used externally as a parasiticide for the cure of scabies, and internally as a mild, though somewhat unpleasant, aperient.

Of the simple compounds of sulphur the following are among the more important:—*Hydrogen*

sulphide or sulphuretted hydrogen, H_2S , is a gas that occurs naturally in some mineral springs and emanations from the soil, and is formed whenever organic matter containing sulphur, such as the albumin of eggs, undergoes decay. It is commonly prepared by the action of dilute hydrochloric acid on ferrous sulphide, $2\text{HCl} + \text{FeS} = \text{FeCl}_2 + \text{H}_2\text{S}$, numerous special forms of apparatus having been devised for the purpose, but for general use Kipp's apparatus serves quite satisfactorily. Hydrogen sulphide is a colourless gas that smells like rotten eggs, and is poisonous. It is slightly soluble in water, liquefies at $-61\cdot5^\circ \text{C}$., and freezes at -82°C . to an ice-like solid. When set on fire it burns in air with a lilac flame, producing water and sulphur dioxide or sulphur according to the quantity of air supplied. Hydrogen sulphide is faintly acid to litmus paper, and forms a series of salts (the sulphides) which are useful in the laboratory as the means of detecting and estimating metallic radicals. The formation of lead sulphide is used as a test for hydrogen sulphide, and is the cause of the blackening of paints containing lead compounds; whilst the formation of sulphide of calcium by the action of slaked lime on the gas is commonly employed to remove hydrogen sulphide from gases containing it. Another important property of hydrogen sulphide is its reducing action—for example, ferric salts are reduced to ferrous salts, its behaviour in this way being made use of commercially to reduce nitro-derivatives to anilines. Hydrogen sulphide is also employed therapeutically, the efficacy of certain mineral waters in the treatment of rheumatism, skin diseases, etc., being probably due to the small quantity of hydrogen sulphide dissolved in them.

Sulphur dioxide, sulphurous anhydride, SO_2 , is a gas that is given off from some volcanoes, and is produced whenever sulphur or its compounds are burned in air. This process, in which either sulphur itself or pyrites, FeS_2 , is burnt, is the method by which sulphur dioxide is obtained commercially, chiefly for the manufacture of sulphuric acid, $\text{S} + \text{O}_2 = \text{SO}_2$, and $4\text{FeS}_2 + 11\text{O}_2 = 2\text{Fe}_2\text{O}_3 + 8\text{SO}_2$. On the small scale sulphur dioxide can be conveniently obtained by heating copper and concentrated sulphuric acid, when a reaction, in the main represented by the equation $\text{Cu} + 2\text{H}_2\text{SO}_4 = \text{CuSO}_4 + 2\text{H}_2\text{O} + \text{SO}_2$, takes place, or by acting on sodium sulphite with sulphuric acid, $\text{Na}_2\text{SO}_3 + 2\text{H}_2\text{SO}_4 = 2\text{NaHSO}_4 + \text{H}_2\text{O} + \text{SO}_2$. Sul-

phur dioxide is a colourless gas, with a very sharp, suffocating smell. It is very soluble in water, one volume of the latter dissolving fifty volumes of the gas at ordinary temperatures. Sulphur dioxide is easily liquefied, at a temperature of $-10^{\circ}\text{C}.$, under atmospheric pressure, and at $15^{\circ}\text{C}.$ under a pressure of 27 atmos-

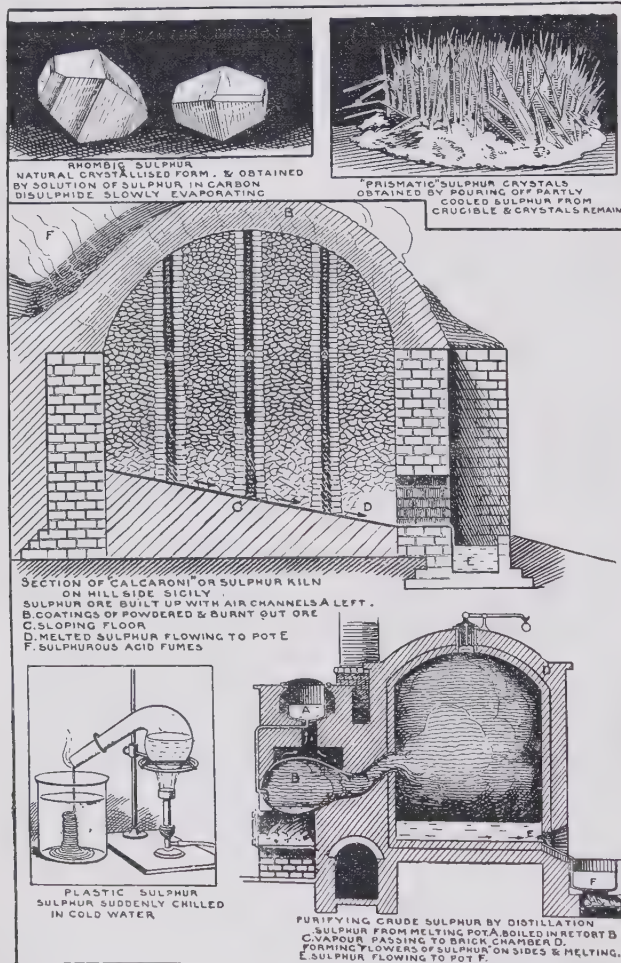
stable dibasic sulphurous acid from which a class of salts (the sulphites) is derived. Sulphur dioxide in the presence of water has powerful reducing properties, converting halogens to hydrogen halides, etc., and destroying various colouring matters. This action is made use of to bleach straw and wool. The gas has also

hydride, SO_3 , is formed to a small extent when sulphur is burned in air. It is prepared either by heating certain sulphates, $\text{Fe}_2(\text{SO}_4)_3 = \text{Fe}_2\text{O}_3 + 2\text{SO}_3$, or by passing a mixture of sulphur dioxide and oxygen over a heated catalytic agent, such as platinized asbestos. Sulphur trioxide is a colourless, crystalline solid, that melts at $15^{\circ}\text{C}.$, and readily volatilizes to a fuming, choking gas; one form of the crystals resembles asbestos, subliming without passing through the liquid state. Sulphur trioxide reacts violently with water to form sulphuric acid, and is employed technically in the preparation of carbon compounds.

Sulphur Dioxide. See SULPHUR and SULPHUROUS ACID.

Sulphuretted Hydrogen. See SULPHUR.

Sulphuric Acid, HYDROGEN SULPHATE, or OIL OF VITRIOL, H_2SO_4 , is almost exclusively prepared by two methods—the 'chamber' and the 'contact' processes. The foundation of the former was laid by Ward about 1740, who prepared sulphuric acid by burning small charges of sulphur and saltpetre in the presence of water under a glass bell. The chemistry of the process is by no means clear, and there is much discussion as to the stages in which the reactions occur; but in effect it appears that sulphur dioxide in the presence of water is oxidized by nitrogen peroxide to sulphuric acid, $\text{NO}_2 + \text{SO}_2 + \text{H}_2\text{O} = \text{H}_2\text{SO}_4 + \text{NO}$; the nitric oxide, to which the nitrogen peroxide has been reduced, is reoxidized to the peroxide by atmospheric oxygen, $2\text{NO} + \text{O}_2 = 2\text{NO}_2$. Thus a comparatively small quantity of nitrogen peroxide serves to oxidize an indefinitely large supply of sulphur dioxide. The details of the process vary somewhat with different makers, but are in general as follows:—Pyrites is burned on the grate of a kiln, producing a gas that contains about 7 per cent. of sulphur dioxide, 10 per cent. of oxygen, and 83 per cent. of nitrogen, and leaving a residue of ferric oxide, $4\text{FeS}_2 + 11\text{O}_2 = 2\text{Fe}_2\text{O}_3 + 8\text{SO}_2$. Occasionally sulphur itself is burnt in shallow pans set in kilns; but most of the so-called 'brimstone acid' is really acid prepared from pyrites that has undergone purification from arsenic. In the flues of the kilns are placed earthenware pots, which can be charged with sodium nitrate and sulphuric acid, thus setting free nitric acid, $\text{NaNO}_3 + \text{H}_2\text{SO}_4 = \text{NaHSO}_4 + \text{HNO}_3$. About from 2 to 12 parts of sodium nitrate are used per 100 of sulphur burnt, according to the care with which the nitrous gases are preserved. The nitric acid is

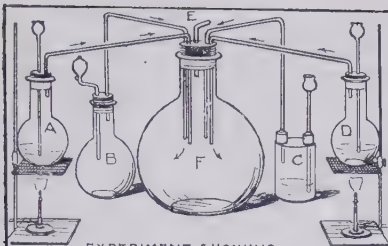


The Preparation of Sulphur.

pheres. The liquid, which is colourless, is readily obtainable commercially, compressed in soda-water 'siphons.' Sulphur dioxide does not burn in air or with ordinary combustibles, though metals, such as potassium, burn brightly in it, forming their sulphides and oxides. The solution of sulphur dioxide in water reddens litmus, forming the un-

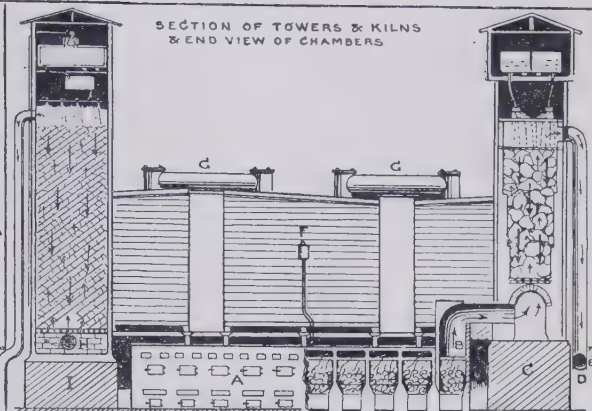
powerful antiseptic action; one of the commonest methods of disinfection is to burn sulphur in the room and shut it up closely for some hours. Sulphur dioxide is further employed as an 'antichlor' to remove the last traces of chlorine from materials bleached with the latter, in the curing of hops, etc.

Sulphur trioxide, sulphuric an-



EXPERIMENT SHOWING PRINCIPLE OF MAKING SULPHURIC ACID

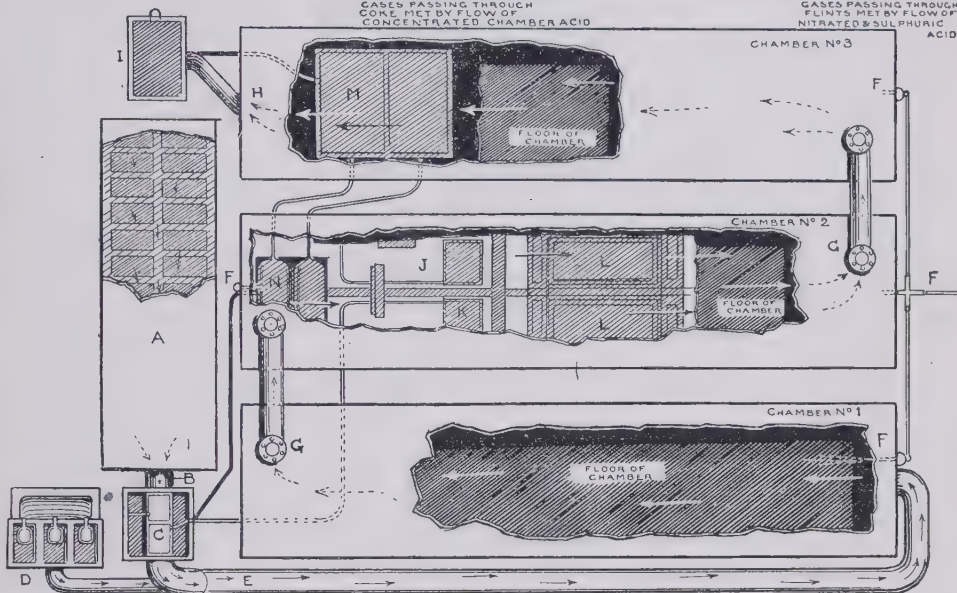
- A. SULPHUR DIOXIDE
- B. WATER ON SODIUM PEROXIDE FORMING OXYGEN
- C. NITRIC OXIDE
- D. STEAM CAREFULLY REGULATED
- E. DRAUGHT TUBE
- F. FLASK IN WHICH CRYSTALS FORM



SECTION OF TOWERS & KILNS & END VIEW OF CHAMBERS

GAY-LUSSAC TOWER CASES PASSING THROUGH CORE MET BY FLOW OF CONCENTRATED CHAMBER ACID

GLOVER TOWER CASES PASSING THROUGH FLINTS MET BY FLOW OF NITRATED & SULPHURIC ACID

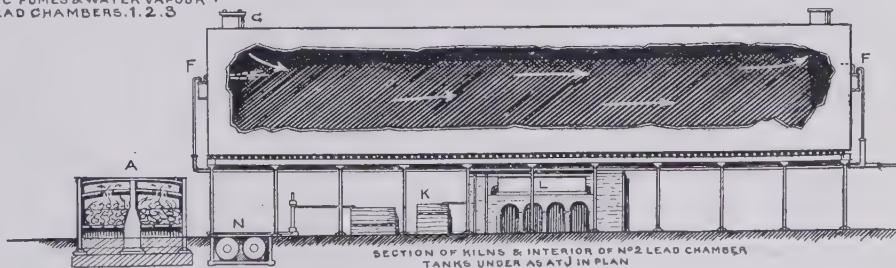


PLAN AND ARRANGEMENT OF PLANT

- A. KILNS BURNING PYRITES
- B. FLUE TO GLOVER'S TOWER
- C. GLOVER'S TOWER
- D. NITRE POTS
- E. MAIN PIPE CARRYING OXYGEN, NITROGEN, SULPHUR DIOXIDE, NITRIC FUMES & WATER VAPOUR TO LEAD CHAMBERS 1, 2, 3

- F. STEAM JETS CONVERTING CHAMBER CRYSTALS TO SULPHURIC ACID
- G. SHAFTS TO CARRY GASES TO 2ND & 3RD CHAMBERS
- H. EXIT PIPE TO GAY-LUSSAC TOWER
- I. GAY-LUSSAC TOWER

- J. PLAN UNDER CHAMBER NO. 2
- K. TANK FOR ACID FROM GLOVER'S TOWER
- L. CONCENTRATING PANS TO FORM STRONGER ACID
- M. NITRATED ACID FROM GAY-LUSSAC TOWER FLOWS TO BOILERS N. TO BE PUMPED BACK TO TOP OF GLOVER'S TOWER.



SECTION OF KILNS & INTERIOR OF NO. 2 LEAD CHAMBER TANKS UNDER AS AT J IN PLAN

probably at once reduced by the hot sulphur dioxide to nitric oxide, $3\text{SO}_2 + 2\text{HNO}_3 + 2\text{H}_2\text{O} = 3\text{H}_2\text{SO}_4 + 2\text{NO}$, and the mixture of gases then passes up a Glover tower, in which the nitrogen oxides, which would otherwise be lost at the exit of the apparatus, are restored. The gases then enter the large leaden chambers, which are the characteristic feature of the process, and there, meeting water in the form of steam or very fine spray, the main reactions mentioned above take place. The chambers are usually in a series of three, one opening into the next. They are built of sheet-lead supported on a wooden frame, the sheets of lead being united without solder by 'burning' or melting the edges together. The bottom of the chamber forms a shallow tray, in which the weak acid formed by the reaction is collected, and whence it overflows into suitable receivers. In order to economize space, part of the chambers are, in some plants, replaced by plate towers, in which the gases are forced up cylinders filled with porcelain plates and meet water passing in the opposite direction. The gases then pass up a Gay-Lussac tower, down which concentrated sulphuric acid trickles over perforated plates or flints so as to 'scrub' the gases thoroughly and dissolve the nitrogen peroxide present; the residue, which is practically nitrogen, free from acid gases, escapes by the chimney. The nitrated acid from the Gay-Lussac tower is pumped to the top of the Glover tower mentioned above, where it is diluted by the addition of the weak chamber acid, and allowed to trickle down and meet the hot kiln gases. Under the influence of the dilution and the action of the sulphur dioxide the nitrogen peroxide contained in the acid is reduced to nitric oxide, and is returned to the gases to enter the chambers again. By this action, in which a considerable quantity of sulphuric acid is formed, and by the evaporative effect of the hot gases, the whole of the acid sent down the tower is concentrated.

Of the acid produced, much is utilized in manufactures in the form of the chamber acid directly obtained. This acid is about specific gravity 1.5 to 1.6, and contains from 60 to 70 per cent. of H_2SO_4 . Part of it can be concentrated in the Glover tower to a specific gravity of about 1.72, corresponding to nearly 80 per cent. of H_2SO_4 ; a similar strength is obtained by evaporation in leaden pans. If required more concentrated, it must be evaporated in glass, or preferably platinum, stills. By these methods

an acid of specific gravity 1.84, corresponding to 98 per cent. of H_2SO_4 , is obtained; but, as a rule, the concentration is not carried further than from 93 to 95 per cent. Besides water and traces of oxides of nitrogen, oil of vitriol is liable to contain lead sulphate and arsenic as its principal impurities. The former is precipitated by diluting the acid, whilst the latter can be removed by hydrogen sulphide, or its presence can be avoided by using sulphur dioxide from brimstone or from the hydrogen sulphide of the alkali waste recovery process. The concentrated acid may also be purified by distillation. Anhydrous sulphuric acid may be obtained by freezing the concentrated acid and separating the crystals, but is better prepared by the contact process, by which fuming acid containing an excess of sulphur trioxide can also be obtained.

In the contact process sulphur dioxide is prepared by burning pyrites as before, and is then very carefully purified, particularly from dust and arsenic, which are fatal to the success of the process. The gases containing sulphur dioxide along with excess of atmospheric oxygen are then heated to a carefully regulated temperature, and brought in contact with the catalytic agent, such as asbestos impregnated with finely divided platinum or ferric oxide, usually the former, when the oxygen and sulphur dioxide unite to form sulphur trioxide, $2\text{SO}_2 + \text{O}_2 = 2\text{SO}_3$. Heat is given out in the process, and is got rid of by making it warm the incoming gases, or dissociation of the product would take place. The sulphur trioxide formed is then absorbed in water, or better, dilute sulphuric acid, $\text{H}_2\text{O} + \text{SO}_3 = \text{H}_2\text{SO}_4$, when acids containing any desired percentage of sulphur trioxide can be obtained. Fuming sulphuric acid is also called Nordhausen sulphuric acid, from its having been originally prepared at Nordhausen in Central Germany by heating partially oxidized ferrous sulphate, from which mixtures of sulphur dioxide, sulphur trioxide, and steam from the water of crystallization present are given off, the last two condensing as fuming sulphuric acid, whilst colcothar or ferric oxide is left, $2\text{FeSO}_4 = \text{Fe}_2\text{O}_3 + \text{SO}_2 + \text{SO}_3$, and $\text{Fe}_2(\text{SO}_4)_3 = \text{Fe}_2\text{O}_3 + 3\text{SO}_3$.

Pure sulphuric acid is a heavy, colourless, oily liquid, which is without odour and does not fume. It is often of more or less brown colour, from having taken up dust and organic matter, and in this state is called B.O.V., or brown oil of vitriol. Sulphuric

acid unites with water with great avidity, much heat being evolved in the process, so that the acid should always be diluted by adding it in a thin stream to water, and not conversely, or explosive ebullition may take place. The affinity of sulphuric acid for water is so great that many substances are decomposed by it with loss of water; thus, sugar is converted into a black carbonaceous mass and formic acid into carbon monoxide. It is owing to this property that the concentrated acid is used to dry gases, and that it has so great a corrosive power in destroying the skin, clothes, etc.; whilst the dilute acid, besides staining woollen fabrics red, rapidly rots textiles of any description. Sulphuric acid is intensely sour and is dibasic, forming both normal and acid salts, called sulphates, by interaction with metals, hydroxides, etc. With metals it behaves in two ways: if diluted and put with iron, zinc, etc., hydrogen is set free and a sulphate formed; whilst when concentrated and heated with copper, mercury, etc., a sulphate and sulphur dioxide is obtained. Concentrated sulphuric acid is without action on iron, and can safely be transported in iron tanks. When heated to boiling, sulphuric acid dissociates into sulphur trioxide and water. The sulphates, whether occurring naturally or derived from the acid, are a class of salts of great importance. Amongst the former, heavy spar, BaSO_4 , gypsum, $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$, celestine, SrSO_4 , and Epsom salts, $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$, are among the most important. The metallic sulphates are prepared artificially by the action of the metal, its oxide, hydroxide, or salt, on sulphuric acid; the details in the individual cases depend on the solubility or otherwise, volatility, etc., of the products. As a class, the normal sulphates are characterized by being well crystallized stable salts, which, with the exception of those of lead and barium, are soluble in water; the insolubility of the latter is utilized as a test for sulphuric acid or any soluble sulphate, a white precipitate being obtained when barium chloride is added to the solution. The acid sulphates or bisulphates, of which sodium hydrogen sulphate, NaHSO_4 , may be taken as typical, are in general similar to the normal sulphates, but have, in addition, a strongly acid reaction. The alums are an important class of double sulphates, in which, in general, an alkali-metal sulphate, such as of potassium, is crystallized with water and the sulphate of either aluminium, chromium, ferric iron, etc., and

forms a compound of the type $K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$.

Sulphuric acid is used in the Leblanc process of making sodium carbonate, and in the bleaching, candle-making, galvanizing, tinplate, and aerated water industries. The production of sulphuric acid is an important chemical industry. Great Britain produces over 1,100,000 tons per annum, Germany and the United States each about 880,000 tons, and France 500,000 tons. The industry is also carried on in Austria, Italy, Belgium, Russia, and Japan. See Lunge's *Sulphuric Acid and Alkali* (new ed. 1903).

Sulphuric Anhydride. See SULPHUR and SULPHURIC ACID.

Sulphuric Ether is a misleading name sometimes given to ordinary, orethyl, ether ($C_2H_5)_2O$, for though usually prepared by the aid of sulphuric acid, it contains no sulphur. See ETHER.

Sulphurous Acid, H_2SO_3 , is unknown in the pure state, a solution of sulphur dioxide in water acting as this acid. This solution is colourless and smells strongly of sulphur dioxide, which is driven off again by heating or by passing air through it. It is acid to litmus and behaves as dibasic, giving rise to a series of both normal and acid salts—the sulphites—which are obtained by the action of the gas or its solution on hydroxides or carbonates of the metals. The normal salts, of which sodium sulphite, $Na_2SO_3 \cdot 7H_2O$, is characteristic, are crystalline and without odour of sulphur dioxide, which is, however, readily set free from them by the action of acids. The acid salts, of which sodium bisulphite, $NaHSO_3$, is typical, smell of sulphur dioxide—a feature which is also characteristic of salts, such as potassium meta-bisulphite, $K_2S_2O_5$, in which sulphur dioxide is united with the normal sulphite. The sulphites are employed, by reason of the sulphur dioxide they can evolve, as reducing agents and preservatives; sodium sulphite is largely used in this way in photography, and calcium bisulphite in brewing. The bisulphites are also valuable in the purification of acetone and aldehydes, as they form crystalline compounds with them.

Sulphur Trioxide. See SULPHUR and SULPHURIC ACID.

Sulpicius, PUBLIUS RUFUS (124–88 B.C.), Roman orator, began his career as a supporter of the senatorial party. In 95 B.C. he accused the demagogic tribune Norbanus of treason; in 93 he was questor, in 89 he served under Pompeius Strabo in the social war, and in 88 he was elected tribune. But before long he joined the party of Marius,

who probably bought his support. He then brought forward and carried some democratic laws, and also passed a decree transferring the command in the Mithridatic war from Sulla to Marius. He was slain in the Sullan proscriptions which followed.

Sultan, a Mohammedan title, signifying a ruling prince, as the sultan of Morocco. The title belongs especially to the Sultan of Turkey, or Sultan of sultans, or Pādishāh. The old English word is soldan.

Sultanpur. (1.) Town, cap.

on island of same name. The group belongs to the U.S.A. Pop. 22,650.

Sulzer, JOHANN GEORG (1720–79), German-Swiss philosopher, was born at Winterthur. In 1747 he was professor of mathematics at the Joachimstal College at Berlin. Frederick II. appointed him professor of philosophy at the Military Academy (1763). His best known work is *Allgemeine Theorie der Schönen Künste* (1771–4), in which he sought for the moral origin of the fine arts. See his *Selbstbiographie* (1809).

Sumach, a name applied to



of Sultanpur dist., United Provinces, India, 58 m. N.N.E. of Allahabad. Pop. (1901) 150,000. The district has an area of 1,707 sq. m., and a population of about one million. (2.) Town, Kapurthala state, Punjab, India, 59 m. S.E. of Lahore. Pop. (1901) 9,000.

Sulu, SOOLOO, or YOLO, archipelago, extending from N.E. Borneo to S. Philippines. The larger islands are of volcanic origin, the smaller of coral formation. Area, about 1,000 sq. m. Teak, rice, coffee, cotton, and indigo are grown. Pearl shells are exported. The capital is Sulu,

certain trees and shrubs belonging to the genus *Rhus*, a subdivision of the order Anacardiaceæ. The sumach or shumac of commerce is obtained from *R. coriaria*. It contains from 10 to 15 per cent. of tannin, and is employed in tanning light goods, and as a mordant in cotton dyeing. See RHUS.

Sumarokov, ALEXANDER PETROVICH (1718–77), Russian dramatist and founder of the modern Russian theatre, was born at Wilmanstrand in Finland. While a student at St. Petersburg he attracted attention with the

tragedy of *Horev*. His collected works appeared in 1787.

Sumatra, isl., Dutch East Indies, lies N.W. to S.E. (5° 40' N. and 5° 59' S., and 95° 16' and 106° 3' 45' E.), and has an area of 161,612 sq. m. The western side is very mountainous, and contains many volcanoes (6,000 to 10,000 ft.). The chief rivers (Musī, Jambi, Indragiri, Kampar, and Siak) all flow eastwards, and the first two are navigable. The chief mineral products are coal and petroleum in Atchin, and gold. The temperature is tropical, but not unhealthy, and the island is covered with luxuriant forests. The chief products are pepper, rattan, gum, caoutchouc, nutmegs, spices, copra, coffee (in Palembang), and tobacco (in Deli). The chief town is Palembang (pop. 53,788). The population (1900) is 3,168,312, nearly 93,000 being Chinese. The other inhabitants are of Malay race; indeed, the Malays of the peninsula claim that their old ruling families came from Menangkabau in Sumatra. The Battas, or Battaks, in the north, are less civilized than the other Malayan divisions, and still practise ceremonial cannibalism. The languages spoken are all variations of Malay, but the written characters are different. Sumatra, like Java, owed much of its early civilization to Indian immigration, which has left behind it some fine remains. Between the 13th and 16th centuries the people became converts to Mohammedanism. The Portuguese in the 16th century acquired a few factories on the coast, which were later taken possession of by the Dutch, who have held them since, except during the British occupation of 1811-16. The British settlement of Benkulen existed intermittently from 1685 to 1825. Atchin in the N. has always been turbulent, and has only lately been subdued. See Marsden's *Sumatra* (1811), Breitenstein's *Sumatra* (1902), and Ireland's *Far Eastern Tropics* (1905).

Sumbawa, isl. of Little Sundagroup, Dutch E. Indies, between Lombok and Flores, occupies an area of 4,900 sq. m. It is almost divided by a deep bay in the N., and rises in Tamboro volcano to 9,100 ft. Rice, tobacco, wax, teak, and edible birds' nests are exported. The town of Sumbawa, on the N. coast, has a good harbour. Pop. 75,000.

Sumbul, a herbaceous plant belonging to the order Umbelliferae. It is a native of Turkestan, but is cultivated in Britain. It grows from eight to ten feet high, and has a very graceful habit and beautiful foliage. The root is used in medicine as a stimulant, by reason of the aromatic oil which it contains. For pharma-

ceutical purposes, the dried root is chiefly imported from Russia and India.

Sumir, or SUMER. See BABYLONIA.

Summary Jurisdiction. A single justice has summary jurisdiction to receive informations, to issue summonses, to exercise jurisdiction in open court, and impose penalties not exceeding 20s. or three days, and to adjourn cases to a petty sessional court. In other cases it is only to be exercised by a court of petty sessions consisting of two justices. The jurisdiction includes certain indictable offences, nuisances where statutory power is given to deal with them, minor offences such as drunkenness, affiliation cases, disputes between employers and workmen, and the enforcement of the Factory Acts. Costs may be awarded to either party. As to appeals, see CERTIORARI and SESSIONS OF THE PEACE.

Summer, the warmest season of the year, begins astronomically in northern latitudes when the sun enters the zodiacal sign of Cancer, about June 22, and terminates at the autumnal equinox, about September 21. 'Midsummer day,' in common parlance, is thus technically the first day of summer, the sun being then at its farthest point of northern declination. Short spells of warm weather in the middle of October and the beginning of November are designated respectively 'St. Luke's' and 'St. Martin's' summer, from the occurrence of these saints' days on October 18 and November 11.

Summons. A summons is (1) generally the first step in police court and other summary proceedings when a warrant of arrest is not issued; (2) a method of obtaining the directions of the High Court as to the way in which an action should be conducted. An originating summons is an inexpensive method, often adopted by trustees, of obtaining the opinion of the court on a question of doubt. See WRIT OF SUMMONS.

Sumner, CHARLES (1811-74), American statesman, born at Boston; called to the bar in 1834; elected to the Senate in 1851. His life for the next few years was devoted to abolition. As a speaker he was one of the most impressive of his day. When freedom had been secured for the slaves, he devoted himself to their social, moral, and educational advancement. His latter years were embittered by acrimonious controversies. Of unbending integrity, he was a man of great independence of character, and advocated the impeachment of President Johnson, although the latter had been his friend. He

was the friend of Whittier and of Longfellow. See *Memoirs* by Pierce (2 vols. 1877), and biographies by Chaplin (1874) and Lester (1874). Sumner's writings and speeches were collected in 15 vols. (1870-9).

Sumner, CHARLES RICHARD (1790-1874), English prelate. George IV. made him his private chaplain at Windsor in 1821. In 1826 he became bishop of Landaff, and in 1827 bishop of Winchester. Sumner published *Ministerial Character of Christ practically Considered* (1824). See *Life* by his son (1876).

Sumner, JOHN BIRD (1780-1862), archbishop of Canterbury, brother of the above, was born at Kenilworth. He became rector of Mapledurham (1818), bishop of Chester (1828), and archbishop of Canterbury (1848). He published *Apostolical Preaching* (1815), *Moral Attributes of the Creator* (1816), *Series of Sermons on the Christian Faith and Character* (1821), and *Evidences of Christianity* (1824). See Sumner's *Bishop Sumner*, pp. 402-404.

Sumptuary Laws are intended to maintain class distinctions, to repress luxury and discourage extravagance, especially among the lower classes, by means of regulations regarding ostentatious expenditure on food, dress, furniture, and ornament. Occasionally legislation of an entirely different character, such as Queen Elizabeth's political Lent to encourage the North Sea fisheries, the regulations regarding the wearing of linen in Scotland and of woollens in England, is called sumptuary; but this is really protective legislation. In America the term is applied to legislation interfering with the habits of the people—e.g. the curfew bell regulation, which makes it a misdemeanour for children to be on the streets after eight o'clock. But this also is a misuse of the term.

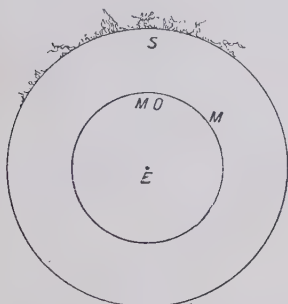
English sumptuary legislation ranges from the 14th to the middle of the 16th century, and is directed chiefly against extravagance in dress, although Edward III. tried to limit the number of courses of food that his subjects might partake of (*De Cibariis Utendis*, 1336). This remained on the statute book till 1856, but it was not, even at first, enforced. In 1363 an act was passed to restrain 'the outrageous and excessive apparel of divers people against their estate and degree.' About 1463 the desire to promote English industry becomes the motive of the legislation, and acts were passed in that year and in 1482. There was further legislation in 1515. Most of the English laws of this character were repealed in 1603.

Sumter, city, S. Carolina, U.S.A., co. seat of Sumter co., 90 m. N. of Charleston. Pop. (1900) 5,673.

Sumter, FORT. See FORT SUMTER.

Sumy, tn., Kharkov gov., S. Russia, 84 m. N.W. of Kharkov city, with breweries, distilleries, tanneries, brick fields, tallow foundries, and candle manufactories. Pop. (1897) 27,575.

Sun, our chief luminary and the ruling body of the planetary system, is a radiant globe 866,400 m. in diameter, at a mean distance of 92,900,000 m., and subtending an angle, as viewed by us, of 32'. It has a superficial area 11,900 times, a volume 1,300,000 times, those of the earth, but is only 331,000 times more massive. Its mean density is, accordingly, 0.255 the terrestrial, or 1/4 taking water as the unit, while gravity at its surface is of 276 times its terrestrial power. The sun rotates on an axis inclined 7° 15' to the



The Sun.

The diagram shows the earth (e), moon (m), and the moon's orbit (mo) against the disc of the sun (s), the red prominences at s being shown on the same scale.

ecliptic in a period lengthening systematically with increase of solar latitude, from about 25 days at the equator to 27½ days in lat. 45°, as determined by observations of sun-spots; and spectroscopic measures of velocity show that the retardation continues at least up to lat. 75°. This vorticeous movement evidently excludes a solid consistence in the body affected by it, and probably indicates virtual gaseity to the core. Besides, the enormous output of light and heat from the photosphere can only be maintained by a rapid interchange of material between the surface and the interior. The illuminative efficacy of sunlight on the earth surpasses thirty times that of an arc light of 2,000 candle-power at a distance of one metre (Young). The accompanying heat-emissions would suffice to melt every minute a shell of ice 64 ft. thick enclosing the sun; they represent the energy of

130,000 horse-power in continuous action on each square metre of the solar surface. The earth intercepts only $\frac{1}{220,000,000}$ of this copious flood. The photospheric temperature derived by Stefan's law from the solar constant is 7,000° to 7,500° C., and has not been proved to vary. Its perpetuation from age to age is explained on dynamical principles by the slow advance of contraction. An annual shrinkage of 300 ft. in the sun's diameter would, it is estimated, supply the thermal expenditure, but not for an unlimited time. In five million years the sun would, by a continuance of the indicated process, have become eight times denser than it is now, and would then almost certainly be incapacitated for vivid radiation. Its extinction may, however, be indefinitely postponed by unknown or barely suspected modes of action, such as the disintegration within its substance of elements akin to radium.

The chemical constitution of the sun is disclosed by the nature of its spectrum. About forty-one substances have been recognized as solar ingredients by their spectral lines. Five among them—carbon, silicon, oxygen, helium, and hydrogen—are non-metallic; the thirty-six metals are iron, nickel, titanium, manganese, chromium, cobalt, vanadium, zirconium, cerium, calcium, scandium, neodymium, lanthanum, yttrium, ytterbium, niobium, molybdenum, palladium, magnesium, sodium, strontium, barium, aluminium, cadmium, rhodium, erbium, zinc, copper, silver, glucinum, germanium, tin, lead, potassium, gallium, and lithium.

The sun moves as a star among the stars, but with only about half their average velocity. Together with its entire system, it is transported at the rate of twelve miles a second towards a point on the sphere located by the best authorities in R.A. 277°, dec. +35°. The nature of the orbit described is unknown. See Ball's *Story of the Sun* (1893), and Lockyer's *Chemistry of the Sun* (1887) and *The Sun's Place in Nature* (1897); also SUNSPOTS.

Sun, THE, was founded in 1893, by Mr. T. P. O'Connor, as a halfpenny evening paper, and a rival to the *Radical Star*. In 1895, however, Mr. O'Connor's connection with it ceased. After great vicissitudes the *Sun* was acquired by Mr. Hooley, the company promoter; and on his bankruptcy it passed into the possession of Mr. Horatio Bottomley, and now belongs to the proprietors of the *Globe*. In December 1903 a further change occurred, the paper becoming Unionist.

Sun Animalcules: See HELIOZOA.

Sunart, LOCH, sea loch, Argyllshire, Scotland, extends 19½ m. E. between Ardmurchan and Sunart on the N. and Morven on the S. from the N. end of the Sound of Mull.

Sun-bath. See BATH.



Sun Bear.

Sun Bear, or MALAYAN BEAR (*Ursus malayanus*), a small species found in forest regions, and extending from the Malay Peninsula and Archipelago into N.E. India.

Sun-birds (*Nectariniidae*) are beautiful passerine birds, often confused with the American humming-birds. They occur throughout Africa, S. Asia, extending southwards to N. Australia, and are all small birds, with long slender bills and an extensible tongue. They frequent woods and gardens, and feed upon insects, insect larvæ, spiders, and upon honey. They are of some importance as agents in the process of pollination. The nests are built of grass, moss, etc., together with cobwebs, and are decorated with pieces of paper, cloth, bark, etc. There is great difference in the coloration of the



Sun-birds.

1. Metallic sun-bird. 2. Malachite sun-bird.

sexes, the males being often gorgeous, and having extra tufts of feathers like the humming-birds. Examples of sun-birds are the malachite sun-bird (*Nectarinia famosa*) of S. Africa and *Cinnyris osea* of Palestine. See Shelley's *Nectariniidae* (1876-80).

Sun-bittern (*Eurypyga helias*), a curious S. American bird, which,

like the kagu, is regarded as an aberrant crane. It is about sixteen inches in length, and has a long pointed beak and a long thin neck, while the body shows curious transverse stripes in white, brown, and black. In flight the bird has been compared to a broad-winged butterfly. It haunts the banks of rivers, especially the Orinoco, and feeds on insects and fish. There is no relationship to the true bittern. Besides the common sun-bittern there is another larger form (*E. major*) of more uniform coloration.

Sunbury, tn., cap. of Northumberland co., Pennsylvania, U.S.A., on the Susquehanna, 54 m. N. of Harrisburg; has railway workshops and silk and woollen mills. Pop. (1900) 9,810.

Sunda Islands, in the Malay Archipelago, generally include Greater Sunda Is. (Sumatra, Java, Borneo, Celebes, Moluccas, etc.) and Lesser Sunda Is. (Bali, Lombok, Sumbawa, Sandalwood, Flores, and on to Timorlaut).

Sundarbans, the waste land, estimated at some 5,500 sq. m., in the Ganges delta, India, between the mouth of the Hugli and the mouth of the Meghna. It derives its name from the abundant sundri (*Heritiera littoralis*), which yield useful timber. Rice is cultivated in the upper portions; the lower is jungle, the haunt of tigers, leopards, and crocodiles.

Sunday. See SABBATH.

Sunday Closing, in Scotland, was provided for by the Forbes Mackenzie Act of 1853. The holder of an innkeeper's certificate is forbidden by an Act of 1862 to sell liquor on Sunday, except to *bonâ fide* travellers and lodgers; and the holder of a public-house certificate, or of a grocer's off licence, is forbidden to open his premises on Sunday for the sale of any goods or commodities whatsoever. The Sunday Closing (Wales) Act, 1831, provides for the closing during the whole of Sunday of all premises in Wales in which intoxicating liquors are sold by retail; but the holders of on licences may sell on Sunday to *bonâ fide* travellers and lodgers, and the act does not apply to sales to travellers at railway stations. The Sale of Liquors on Sunday (Ireland) Act, 1873, provides for the closing of licensed premises in Ireland during the whole of Sunday, except in Dublin, Cork, Limerick, Waterford, and Belfast, where they may be open between two and seven p.m. The act contains exemptions in the case of sales to lodgers and *bonâ fide* travellers, and in packet boats, and certain canteens, and to travellers at railway stations. In England licensed premises

within the administrative county of London, or the four-mile radius, from Charing Cross, may be open on Sunday between 1 and 3 p.m., and between 6 and 11 p.m.; and outside this area they may be open between 12.30 and 2.30 p.m. and between 6 and 10 p.m. Of recent years there has arisen a movement in favour of the closing of shops on Sunday, and in 1905 a Sunday Closing (Shops) Bill was framed, but it failed to pass the House of Lords.

Sunday Schools. Sunday schools for general instruction were not uncommon in the 17th century—e.g. in 1608 in the Netherlands. Sporadic attempts at the formation of Sunday classes for children were also made in England, as by Richard Baxter in 1634. But the idea of the Sunday school for children as a direct adjunct of each congregation was put into practice by Robert Raikes at Gloucester in 1780. Raikes found a sympathetic helper in Thomas Stock. At first reading and writing had to be taught as well as religion. The Rev. Rowland Hill took the matter up warmly in London, where the first Sunday school was opened in 1784. A Sunday-school Society followed for the spread of the system throughout Britain. It is said that in 1789 there were already 300,000 scholars at such schools. It was at first necessary to pay the teachers, but voluntary teachers became at length available. In Wales the movement dates from 1789: the first Welsh Sunday school was opened by Thomas Charles of Bala. There had been a few attempts at Sunday-school work in Scotland somewhat earlier, but the movement was only recognized publicly in 1786, and was not generally adopted until 1795. Dr. Chalmers's name is intimately connected with it. In Ireland something was being done in 1770, but the Raikes system was not taken up until 1785. The Irish Sunday-school Society was established in 1809. Sunday schools have taken a specially deep root in the United States. The first school in America is said to have been opened in Hanover co., Virginia, in 1786. The New York Union was formed in 1816, and the American Sunday-school Union in 1824. The Sunday school in America is treated as the foundation of the congregation.

The English Sunday-school Union dates from 1803. It issues an ably-managed paper, a scheme of lessons for every Sunday, a great number of books and magazines for children. The Church of England Sunday-school Institute, founded in 1843, does similar work. The Wesleyan Sunday-

school Union was formed in 1874. A Sunday-school centenary was held in 1880, when the number of teachers throughout the world was stated as 1,425,233, with over twelve million scholars.

Sunderland, munic., parl., and co. bor., and seapt., Durham, England, at the mouth of the Wear, 15 m. N.E. of Durham. It comprises the parishes of Monkwearmouth, Bishopwearmouth, and Sunderland. The first district lies N. of the Wear, and the others S., the three being connected by a cast-iron bridge, completed 1796, and a railway bridge. The parish church of St. Peter, Monkwearmouth, was founded in the 7th century by Biscop, in connection with the monastery where Bede became a student. St. Michael's, Bishopwearmouth (originally 10th century), contains some 13th-century work. The town hall is a handsome modern structure. Amongst other public buildings are the public library, museum and art gallery, People's Palace, and Victoria Hall. The port at the river mouth is enclosed by two long piers. Great improvements have recently been made, forming a fine harbour of refuge of 150 ac. There is trade in coal (nearly 5½ million tons). Sunderland is one of the foremost steel shipbuilding centres in the United Kingdom; and there are engineering, anchor, and chain-cable works, roperies (hemp and wire), glass works, forges, and other industries. About 1 m. N. of the town is the residential and sea-bathing district of Roker. Sunderland returns two members to the House of Commons. Pop. (1901): munic. bor., 146,077; parl. bor. (including Southwich), 158,877.

Sunderland, ROBERT SPENCER, EARL OF (1640-1702), British political intriguer and statesman, was born at Paris. He was employed as ambassador to Spain in 1671, and on his final return to England (1679) he became secretary of state. At the revolution the trusted counsellor of Charles II. and James II. had no difficulty apparently in becoming the equally trusted counsellor of William III. It was on his advice that the king came to rely on a homogeneous administration chosen from one party—a constitutional change of enormous importance.

Sundew, the popular name of certain plants belonging to the genus *Drosera*.

Sundial, an instrument for measuring time by using the shadow of the sun. The most common is the horizontal dial, placed flat or parallel to the horizon; another form is the vertical dial, fastened, for ex-



Some typical Sundials.

1. Greek (Leyden Museum). 2. Greek (British Museum). 3. Greek (from the 'Tower of the Winds,' Athens), executed about 50 B.C. by Andronikos of Kyrrhos: lines of dial chiselled on wall under frieze. 4. Roman: portable, c. 300 A.D. 5. Early English: St. Michael's, Winchester. 6. Early English: St. Cuthbert's, Darlington. 7. 8. Renaissance (Dover Museum). 9. Bolton Abbey. 10. Renaissance: Upton, Northants. 11. Glamis Castle. 12. Modern: Temple, London. 13. Deanery Garden, Rochester. 14. Wrest, Bedfordshire (from *The Formal Garden*, Messrs. Macmillan). 15. Trellech Churchyard.

ample, against an upright wall; the least common is the inclined dial. (1.) The horizontal dial frequently consists of a flat table, firmly placed on a solid pedestal, and having a small rod, called the gnomon, rising from its centre inclined to the meridian line of the dial at an angle equal to the latitude of the place. The shadow of the rod moves round the northern part of the dial from morning to afternoon, and thus supplies a rough measurement of the hour of the day. For the rod it is more convenient to substitute the straight edge of a triangular plate of metal. (2.) The vertical dial, if perpendicular to the meridian, faces the south or north. If not in that position, the dial is said to be declined. The hour lines of a south vertical dial are shown in Fig. 9. (3.) Of inclined dials the simplest is the polar dial, where the plane is parallel to the earth's axis, and therefore also parallel to the style. In this case the hour lines are parallel to each other.

The 'universal dial' is merely a circular disc with a rod as gnomon in the centre fixed perpendicular to the plane of the disc. If the dial be graduated into twenty-four equal divisions, each supplies one of the hour lines; and if the gnomon be parallel to the axis of the earth, and therefore pointing to the north pole, the instrument is complete for any latitude and time. Some curious varieties are described in Ferguson's *Lectures* (Brewster's ed.), Dawbarn's *The Sun Dial* (1891), and Gatty's *Book of Sun Dials* (new ed. 1900).

Sundsvall, tn., Västernorrland co., Sweden, at mouth of Insdal R., 117 m. N. of Gefle; has iron industries, sawmills, shipbuilding yards, and exports timber and iron. It was almost totally destroyed by fire in 1888, but has been rebuilt as one of the finest towns of Sweden. Pop. (1900) 14,831.

Sundt-Hansen, CARL FREDERIK (1841), Norwegian painter, ranks with Tidemann as a clever painter of peasant life. His chief works are *The Betrayed Peasant Girl*, in the National Museum at Stockholm; *The Culprit's Confession*, in the National Gallery at Christiania; *Burial at Sea*, in the civic gallery at Danzig, and *The Visitation*.

Sunfish, a popular name applied to at least three different kinds of bony fish. (1.) The true sunfishes are species of *Orthogoriscus*, and are closely allied to the globe-fishes, from which they differ chiefly in their short compressed bodies, which cannot be inflated, the extremely short and truncated tail, and the confluent

ventral fins. The common sunfish (*O. mola*) may be from seven to eight feet long, and is bulky out of all proportion to its length. It is widely distributed, and not infrequently occurs off the southern coasts of England and round Ireland. The young forms differ markedly from the adults in shape. (2.) *Lampris luna*, a beautiful form allied to the so-called 'dolphin' (*Coryphæna*). Its body is compressed and elevated, and covered with small scales. The fish reaches a length of about four feet, and is bluish, spotted with silver, with scarlet fins. It is an edible form, and occurs in the Atlantic and Mediterranean. The names opah and king-fish are also applied to it. (3.) Three genera of small fresh-water percoid fishes, found in the waters of N. America. They rarely exceed six inches in length, and belong to the genera *Centrarchus*, *Bryttus*, and *Pomotis*.



Sunflower (*Helianthus multiflorus*).

Sunflower, the name of a species of herbaceous plants belonging to the genus *Helianthus*, a subdivision of the order Compositæ. The common annual sunflower is *H. annuus*, which requires to be raised from seed sown in the spring. It should be grown in deep and strong soil. The vigorous perennial autumn-blooming sunflowers are rampant

growers, and care must be taken to keep them away from tender and easily choked plants.

Sungari, riv., Manchuria, a trib. of the Amur, which it joins from the right 220 m. above Khabarovka. It rises in the Long White Mts., flows N.W. to Kirin, thence due N. to the junction of the Nonni, and thence N.E. to the Amur. In some parts of its course of 850 m. the Sungari is only a few feet deep, and spreads out to a width of more than a mile, while in other mountainous parts its channel is narrowed to 300 or 400 ft. It is navigable by light steam craft as high as Kirin. It teems with fish, including sturgeon, trout, and salmon. In winter the river is frozen for five months, when it is used as a highway.

Sungei Ujong, British protected native state of the Malay Peninsula, in the confederacy of Negri Sembilan, lies on the Strait of Malacca, immediately N. of the British colony of Malacca. The country is low and swampy on the seaboard, hilly inland, and produces rice, rubber, sugar, coffee, tapioca, and tin. Area, 1,860 sq. m. Pop., largely Chinese, about 30,000.

Sunium, the ancient name of the rocky promontory (200 ft.), which forms the S. extremity of Attica in Greece. On the highest point was a temple of Athena, dating probably from 450-400 B.C.

Sunn, a fibre obtained from the sunn hemp, *Crotalaria juncea*, largely cultivated in India. It is much used for rope-making.

Sunnites, more correctly SUNNIS. The death of Mohammed, the founder of Islam, without male heirs, and his omission to appoint a successor, led to the division of Islam into two sacerdotal and political factions, the Shiites and the Sunnites. The latter sect took its name from a collection of books on traditional law, called the Sunna, which are received as having authority concurrent with and supplementary to the Koran. This sect also claims the right of nominating the prophet's successors. The Shiites became the poets, the Sunnites the warriors, of Islam. The bulk of the population of Turkey are Sunnites.

Sun Pillar. See HALO.

Sunshine Recorder. The instruments used for recording the duration of sunshine are of three classes—burning, photographic, and electrical. Of the burning, the form principally in use is the Campbell-Stokes, which consists (Fig. 1) of a metal bowl, securely fixed by means of a brass bracket to a slate base. In front of the bowl a glass ball four inches in diameter is fixed, while the inside of the bowl is grooved so as to

accommodate the slips of card upon which the record is burned. The instrument is adjusted for latitude, and when placed in position faces the south. When the sun is shining the glass



FIG. 1.

ball casts an image which is brought to a focus on the card and chars its surface. As the sun moves the image gradually traverses the card, which is thus charred during sunshine, and left untouched when the sun is obscured by clouds. The cards are divided into hours and half-hours, so that the distribution of sunshine through the day is graphically indicated. This instrument was invented in 1853 by Mr. Campbell of Islay, and in 1876 Sir George Stokes invented the metal bowl. The present form of photographic recorder (Fig. 2)

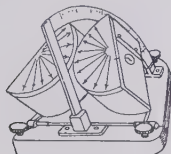


FIG. 2.

was designed in 1885 by Mr. T. B. Jordan. In its improved form it consists of two hemicylindrical boxes, one to contain the morning and the other the afternoon record. On the inside of each is placed a strip of cyanotype paper; sunlight, admitted by an aperture in the centre of the rectangular side of each box, is received on the paper, and travelling over it by reason of the earth's rotation makes a trace on the paper. In the Dines recorder the sunshine is recorded electrically. The sun shines on a bent glass tube (Fig. 3), one end of which is covered

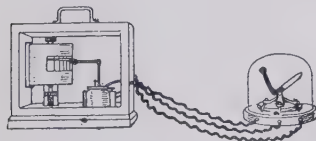


FIG. 3.

with lampblack. The tube contains a small quantity of mercury and a little ether. The sun's rays cause the blackened end to heat more than the other, so that the pressure of the ether vapour

causes the mercury to be driven away from the blackened end. As the tube is mounted on pivots, the change of position of the mercury overbalances its holder, which topples over until stopped by an electric contact piece. When the sky is overcast the mercury returns to its normal position along with the holder. The metal holder containing the glass tube is connected through an electric battery to the registering apparatus. (See *Quart. Jour. Roy. Met. Soc.*, xxvi. 243.) Self-registering platinum resistance thermometers are also used as sunshine recorders. For recording the duration of clear sky at night the pole star recorder is employed. See 'Sunshine Recorders and their Indications,' by R. H. Curtis, in *Quart. Jour. Roy. Met. Soc.* (xxiv., 1898).

Sunspots, dark markings frequently visible on the solar surface, discovered by Fabricius in 1610. They appear to be breaks in the photospheric clouds, and vary in dimensions from 'pores' some hundreds of miles across

phases of development. During active growth they sometimes advance 6,000 to 8,000 m. a day, dropping behind in their decline. They occasionally give evidence of internal gyrations, but not with sufficient regularity to lend support to Faye's cyclonic theory of their origin. The spectra of sunspots prove their obscurity to arise from increased absorption. The temperature in spots is probably very high. They frequent two zones on the sun's surface, in 5° to 35° N. and S. lat. Scarce near the equator, they seldom, if ever, occur beyond lat. 45°. The periodicity of their outbursts was detected by Schwabe in 1851. The average length of the cycle is 11.13 years, divided into periods of increasing and decreasing activity, which last respectively 4.62 and 6.51 years. The last epoch of calm was about June 1901. The distribution of spots varies with the progress of the cycle. A steady diminution of mean latitude accompanies the development of each fresh wave of disturbance—the first members of the series



A Sunspot approaching the Edge of the Sun's Disc.

to enormous chasms from 40,000 to 50,000 m. in diameter. The largest on record measured (Feb. 2, 1905) 109,000 by 63,000 m., and covered $\frac{1}{16}$ of the sun's disc. A 'normal' spot consists of a central 'umbra,' which looks black by contrast with its surroundings, but is really (according to Langley) 500 times brighter than the full moon. It includes darker 'holes,' and is surrounded by the 'penumbra,' a semi-obscure fringe of filaments, which frequently overhang the umbra like a thatch or span it with lustrous 'bridges.' The belief has lately come to prevail that spots differ widely in structure and level. They indeed show manifold irregularities. Some are mere formless openings; others appear as congeries of fragmentary umbrae and penumbral shreds; most form groups or trains, the average duration of which is fifty-six days (Cortie). Individual large spots commonly persist through several solar rotations. One in 1840-1 lasted eighteen months. Spots drift with the sun's surface, and have, besides, small 'proper' motions depending upon their

appearing just after minimum in high latitudes, the final ones closing down towards the equator. This 'law of zones' was noted both by Carrington and by Spörer. The periodicity of sunspots is closely followed by terrestrial magnetic and auroral phenomena. The cause of sunspots remains obscure.

Sunstroke, **INSOLATION**, or **HEAT EXHAUSTION**, is produced by exposure to excessive solar or artificial heat. Alcoholism, physical weakness, want of health, and atmospheric moisture predispose to it, while prolonged residence in tropical climates establishes some degree of tolerance. Three varieties are described, but most cases are of a mixed type. In some the heart suffers most, and cardiac failure, syncope, and subnormal temperature are the leading symptoms; in others the respiratory system is chiefly involved; while a third group is characterized by nervous symptoms and hyperpyrexia due to derangement of the heat-regulating mechanism. Most who suffer from the syncope form make a complete recovery. The respira-

tory or asphyxial variety is more dangerous, being associated with elevation of temperature and derangement of the nervous system. Recovery is frequently tedious or imperfect. The hyperpyrexial form is the gravest of all, and frequently produces death by convulsions or by coma. Even when partial recovery takes place, the profound disturbance of the cerebro-spinal nerve centres may prove the forerunner of dementia or of another form of insanity. Treatment must be prompt and energetic. Syncope should be overcome by stimulants and the ordinary measures for resuscitation. When the temperature is markedly subnormal hot baths may be necessary. In the other forms the temperature is generally elevated, and ice should be applied. Antipyretic drugs may be used cautiously. Patients who exhibit symptoms of intense asphyxia may sometimes be bled with advantage.



Sun-worship.

Sacred wheel and symbol used in the sun-dance of the N. American Indians.

Sun-worship. The conception of the sun as the author of all things, the bringer of light, warmth, and life to mankind, would seem to be an idea common to all races. Ancient Mexico and Peru had their temples of the sun; and to-day the Indians of the North American plains celebrate their 'sun dance' with many solemn rites. The Arapaho sun dance in particular has been described with great elaboration by Mr. G. A. Dorsey of the Field Columbian Museum, Chicago (*Museum Publication* 75, June 1903). Among these Indians the sacred wheel, symbolizing the sun, is held in reverence; and the same symbol figures in the solar worship of the Old World, where it sometimes assumes the shape of the sun-cross. In Japan the sun-goddess has been worshipped from the earliest times. Babylonia, Persia, Egypt, Greece, all had their solar deities, altars,

and temples; and the Romans worshipped the sun-gods Mithras and Apollo, derived respectively from Persia and from Greece. Mr. Elton (*Origins*, p. 232) points to several survivals of sun-worship among the peasantry of the British Isles. It is manifested also in orientation—in churches, graves, at the recital of creeds. The Parsees reverence the sun as the chief symbol of the divine Ormuzd (Ahura-Mazdão).

Suonada, the Japanese name for the Inland Sea of Japan.

Sup. (*supra*), above.

Super-cooling. If a liquid is cautiously cooled down in a perfectly clean vessel, its temperature can often be reduced considerably below its proper freezing-point without solidification taking place. If, however, a fragment of the solid is introduced, freezing instantly occurs. The moment the liquid commences to solidify the latent heat of fusion is set free, and the temperature at once rises to that of the true freezing-point, and remains at that point till complete solidification takes place. Water may be slowly cooled in this way in an air-free vessel as far as -15°C . Compare **SUPERSATURATION**.

Supererogation, WORKS OF, are voluntary acts of piety not strictly commanded of God and not essential to salvation. The teaching that it is meritorious to perform such acts is condemned by Article XIV. of the English Book of Common Prayer.

Superfœtation, a term applied during the pregnancy of a mammalian female to the fertilization of a second ovum at a considerably later date than the first. It is possible in females possessing a double or bicornuate uterus; and a woman with this abnormality might bear a second child three months after the first. It is said to be common in the hare.

Superior and Superiority, in Scots law. Property in land in Scotland is acquired by grant, which was originally of a military character, but is now obtained in return for a fixed yearly payment called a feu-duty, and certain periodic payments called casualties. The person who makes the grant is called the superior, and the interest which he retains in the subject of his grant the superiority.

Superior. (1.) City, Wisconsin, U.S.A., co. seat of Douglas co., at the head of Lake Superior, and across a narrow bay from Duluth, Minnesota. Its industries deal with iron, woollens, lumber, and flour. Pop. (1900) 31,091. (2.) The uppermost and largest of the great lakes of N. America; connected with Lake Huron by St. Mary's R. Its

length is 412 m., its greatest breadth 165 m., and its area 31,800 sq. m. The area of its drainage basin, including its own area, is 80,400 sq. m. Its altitude above the sea is 602 ft.

Superphosphate, the mixture of calcium hydrogen phosphate, $\text{CaH}_2(\text{PO}_4)_2$, and gypsum, $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$, obtained by treating finely ground bone ash or the crude mineral phosphate, $\text{Ca}_3(\text{PO}_4)_2$, with dilute sulphuric acid of specific gravity 1.57. The mixture sets solid, and is ground for use as a manure, its value depending on the amount of soluble phosphate present. This may vary from as low as 20 per cent, with some of the mineral superphosphates up to 75 per cent, if a bone ash is used alone.

Supersaturation. If a solution of a crystalline solid is evaporated or cooled, a point is eventually reached at which there is present in the liquid as much of the solid as it can dissolve; and on continuing the process the solid separates in crystals if there are crystals of the same kind present. Compare **SUPER-COOLING**.

Superstitious Uses are trusts designed to propagate religion not tolerated by law. Formerly Roman Catholic and Jewish trusts were void as superstitious; but now educational or religious trusts among Roman Catholics or Jews are valid, but not a trust to say masses for the dead, except in Ireland.

Suppé, FRANZ VON (1820-95), Austrian musical composer, born at Spalato, Dalmatia. He was musical director at Vienna, and wrote operas, many of which were popular in Germany; but his only compositions known in England are the operas *Fatinitza* and *Boccaccio*, and the overture to *Dichter und Bauer*.

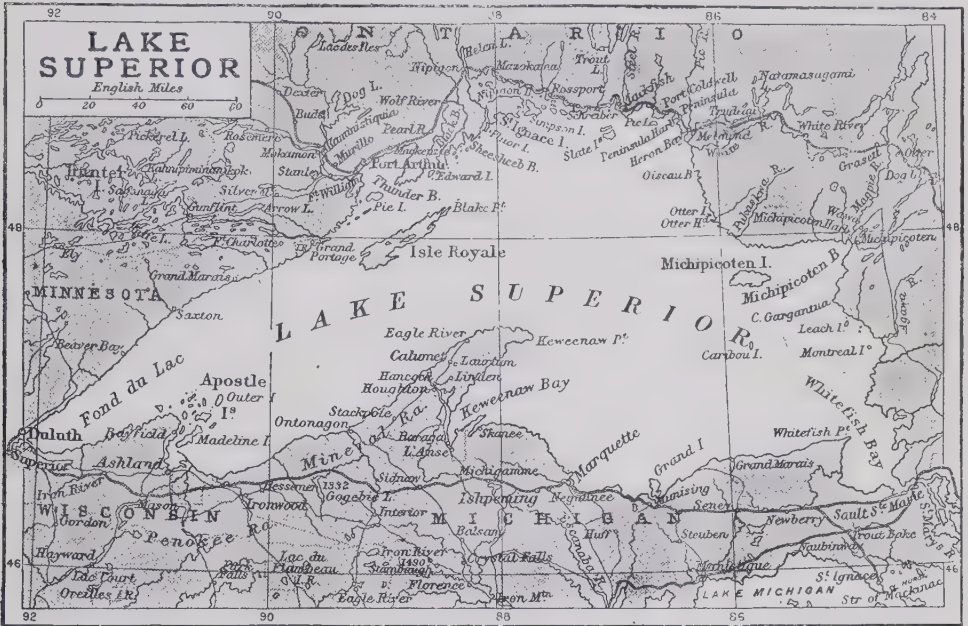
Supple Jack, a name given to two twining shrubs—the American *Berchemia volubilis*, belonging to the order Rhamnaceæ; and the West Indian and South American *Seriana triterinata*, belonging to the order Sapindaceæ. The stems of the latter are often used for making walking-sticks.

Supply. (1.) A grant of money provided by a national assembly to meet the expenses of government. The right of voting supplies in Britain is vested in the House of Commons, and the exercise of this right is practically a law for the annual meeting of Parliament for redress of grievances. But a grant from the Commons is not effectual in law without the ultimate assent of the sovereign and the House of Lords. (2.) A term used to express the system by which an army is provided with all material wants, both stores and supplies. (See

STORES.) Supplies are usually obtained by contracts. Exceptionally, at a few stations, bread is made and meat prepared by the supply companies of the Army Service Corps. Contracts are entered into yearly for each locality, after advertisement for tenders. Rations are conveyed daily to the quarters of the several units stationed in the command by the bread and by the meat contractors, while other supplies are furnished periodically at longer intervals or as demanded. In time of war all things necessary for supply come under the authority of the officer of communications. The actual means and operations of convey-

Supply, COMMISSIONERS OF, former Scottish administrative officials. Commissioners were appointed in the reign of Charles II., with powers to collect the sums necessary for the administration of the shires, whether by tax on land, or by cess, or by excise. In 1854 the care of such matters in a district or town was placed in the hands of the magistrates, also of the sheriff and sheriff-substitute and of all landowners and property owners or their legal representatives. By them the assessment rates were struck, and they were responsible for the collection of the tax through their paid officials. This system prevailed until 1889, when

Suprarenal Capsules, two small ductless glands which lie one over each kidney. They are asymmetrical and unequal in size, the left being the larger. They have extensive arterial and nerve supplies. Their functions are imperfectly known, but to tubercular changes in these glands physicians have long attributed Addison's disease. In more recent years the administration of the gland substance and of adrenalin has been of service in some cases of Addison's disease; but the chief value of both substance and extract lies in their powerful local astringent and haemostatic action. Solutions applied locally produce blanching and shrinkage of nor-



ing the stores to the advanced depôts form no part of supply proper, but come under the head of 'transport.'

Supply and Demand, in economics. The equilibrium of demand and supply is reached when at a given price the demand is just great enough to absorb or carry off the supply; but the phrase 'at a given price' is essential, for supply and demand are both relative to price. The analysis of supply involves a consideration of human efforts and their conditions; and the analysis of demand involves a consideration of the psychology of human desires and of the existing distribution of wealth and education. See Marshall's *Principles of Economics* (1891).

the Local Government (Scotland) Act put all such business into the hands of the county councils.

Supporters. See HERALDRY. **Suppository,** a medical substance made up in the form of a cone, and inserted in the lower bowel, the uterus, or the vagina, to gain certain specific effects, not readily obtained by medicine taken in the ordinary way. See ENEMA.

Suppuration is the formation of pus in inflamed tissues. It may be caused by chemical irritants, such as silver nitrate, turpentine, and croton oil, but it is most usually due to the irritation of the tissues by pyogenic or pus-producing bacteria, chiefly staphylococci, streptococci, and pneumococci. See PUS.

mal and of inflamed tissues, without having a caustic effect; and this property renders them of considerable use in the treatment of hay fever and coryza, as well as in other inflammatory and hemorrhagic conditions.

Supremacy, ROYAL. The article in the 'oath of allegiance' taken by subjects to the English sovereign formally contained a reservation of the king's authority as being uninfluenced by any power claimed by the Pope as 'God's vicar on earth.' At the reformation Henry VIII. asserted his own personal supremacy in the most unmistakable way, and to such an extent that Sir Thomas More and others preferred death or imprisonment to the admission of it. Elizabeth on her accession

preferred to keep in abeyance the title of 'only supreme head on earth of the Church of England,' though the oath of supremacy was ordered to be exacted from all those holding the higher public offices in the country, along with the oaths of allegiance and abjuration. In 1858 the three oaths were unified. At present the oath of allegiance is held to cover recognition of royal supremacy, and it is not demanded from members of Parliament, though it still exists in a modified form in the episcopal writs of appointment.

Supreme Court. The idea of consolidating the higher courts of England into one Supreme Court was contemporaneous with that of concentrating the different courts in one building at the Royal Courts of Justice; but it was earlier given effect to by the Supreme Court of Judicature Act, 1873, which consolidated the High Court of Chancery of England, the Court of Queen's Bench, the Court of Common Pleas at Westminster, the Court of Exchequer, the High Court of Admiralty, the Court of Probate, the Court of Divorce and Matrimonial Causes, and the London Court of Bankruptcy, into one branch of the Supreme Court by the title of Her Majesty's High Court of Justice. The act also constituted Her Majesty's Court of Appeal as the other branch of the Supreme Court. To the Court of Appeal was transferred the appellate jurisdiction of the Lord Chancellor and of the Court of Appeal in Chancery, including the jurisdiction in bankruptcy appeals, the jurisdiction of the Court of Appeal in Chancery of Lancaster, and of the Chancellor of the County Palatine, the jurisdiction of the Court of the Lord Warden of the Stannaries, the jurisdiction of the Court of Exchequer Chamber, and the jurisdiction of the Judicial Committee of the Privy Council in admiralty and lunacy appeals.

At first the High Court consisted of five divisions—Chancery, Queen's Bench, Common Pleas, Exchequer, and Probate, Divorce, and Admiralty. By subsequent legislation the number has been reduced to three—the Common Pleas division and the Exchequer division having been united with the King's Bench division. The Chancery division is under the presidency of the lord chancellor, and consists of six puisne judges. The King's Bench division consists of fourteen judges, under the presidency of the lord chief-justice; while the Probate, etc., division has a president and one other judge. The Court of Appeal consists of the master of the rolls and five lords justices; but the presidents of the three

divisions of the High Court can also sit in the Court of Appeal.

The judicial work of the High Court is carried out, in the King's Bench division, by masters, by the judge in chambers, by judges sitting for the trial of actions either with or without juries, and by divisional courts sitting either as courts of appeal from inferior courts, or from orders in chambers which are not matters of practice or procedure.

In the Chancery division each matter is assigned to a particular judge, who deals with it as a judge of first instance, subject to appeal to the Court of Appeal. In the Probate, etc., division the registrars deal with summonses in the first instance, and the other judicial arrangements are similar to those of the King's Bench division. During the vacations a judge is appointed to deal with urgent matters. The Court of Appeal sits in two divisions, one of which hears appeals from the King's Bench and Probate divisions, including motions for new trials, while the other hears those coming from the Chancery division and the Lancaster Court of Chancery.

The clerical work of the Supreme Court (except that of the Probate, etc., division) is carried on by the central office, where writs are issued, affidavits filed, judgments and orders recorded. The masters of the Supreme Court in the King's Bench division have jurisdiction to make orders on summonses (with certain exceptions) in the first instance, and also to tax bills of costs. In the case of summonses there is an appeal to the judge in chambers, and from him in matters of practice and procedure to the Court of Appeal, and in other matters to a divisional court. In the Chancery division the masters have no original jurisdiction; they only act as the deputies of the judges. In the Probate, etc., division the work corresponding to that of the central office, and of the masters of the King's Bench division, is done in the Probate, etc., registry at Somerset House. In the country the work of the King's Bench division, which in London is done by the central office and the masters, is under the district registrars.

In Ireland the Supreme Court is constituted similarly to that in England, except that there are only two divisions—the Chancery, consisting of the lord chancellor, the master of the rolls, the vice-chancellor, and the land judge; and the King's Bench, which has jurisdiction in probate, admiralty, matrimonial, and bankruptcy matters, and consists of the lord chief-justice, the chief baron, and eight judges.

Surabaya, tn., cap. of residency of same name, Java, Dutch E. Indies, on Madura Strait on N. coast; has a good harbour, and is the naval and military headquarters of the Dutch E. Indies. Rice, coffee, cotton, and sugar are exported. Pop. (1900) 146,944.

Surajah Dowlah. See SIRAJ-UD-DAULA.

Surakarta, tn., cap. of residency of same name, Java, Dutch E. Indies, 33 m. E.N.E. of Djokarta; has the palace of the native ruler, and an active commerce. Pop. (1900) 86,074.

Surat, tn., cap. of dist. of same name, Gujarat div., Bombay, India, on l. bk. of Tapti, 14 m. above its decayed port, Savali. Cottons and silks are manufactured. Pop. (1901) 119,306. The district covers an area of 1,662 sq. m., and has a population (1901) of 636,602. In the 16th century it was one of the principal commercial cities of India. The British established themselves there in 1612. In the 17th century it was pillaged several times by the Marathas. Its commerce has been largely absorbed by Bombay.

Surbiton, par. and tn., Surrey, England, 1 m. S. of Kingston-on-Thames. Pop. (1901) par. 11,981.

Surcouf, ROBERT (1773-1827), French privateer, born at St. Malo. His principal exploits were in the Indian seas; his capture of the *Triton* in 1785, and of the *Kent* in 1800, caused a great sensation.

Surds, in algebra, and especially in the theory of numbers, may be defined as the incommensurable root of a commensurable number. The n th root of any number is that quantity which when multiplied by itself $(n-1)$ times in succession gives the number. Thus the square of the square root of 2 is 2, and the cube of the cube root of 7 is 7. $\sqrt{2}$ and $\sqrt[3]{7}$ are incommensurable, and are therefore surds. $\sqrt{4}$ and $\sqrt[3]{27}$ are not surds, because they are respectively the commensurable numbers 2 and 3. A quantity of the form $\sqrt[n]{p}$ can be expressed as a surd of the form $m+\sqrt[n]{p}$. But the expression $\sqrt{q+\sqrt{p}}$ is not a surd if \sqrt{p} is itself a surd; for then $q+\sqrt{p}$ is not a commensurable number. When surds can be expressed in terms of the same surd, they are said to be similar. Thus, $\sqrt{12}$ being equal to $2\sqrt{3}$ is similar to $\sqrt{3}$. The square root or quadratic surd is by far the most important surd with which mathematicians have to deal; but similar properties hold for surds of higher name. A very important theorem in quadratic surds is that, if $x+\sqrt{y}=a+\sqrt{b}$, where

a, b, x, y are commensurable numbers and \sqrt{y}/\sqrt{b} incommensurable — *i.e.* true surds — then $x=a$ and $y=b$. Another interesting problem is to find the condition that $\sqrt{(p+\sqrt{q})}$ may be expressible in the form of the sum of two surds — *viz.* $\sqrt{x}+\sqrt{y}$. The conditions are that p^2-q must be a positive perfect square, and that p must be positive. Surds are sometimes called irrational numbers.

Surety. See GUARANTEE.

Surface, in geometry, may be defined as a continuum of points in two dimensions — *i.e.* having (say) length and breadth but no thickness. Every finite region of ordinary space is necessarily bounded by a surface, and any two contiguous regions are separated by a surface. In the former case the surface is closed; in the latter it is usually limited by a rim, which is of the nature of a line — straight, curved, or made up of straight and curved parts. Surfaces are classified in various ways according to their properties, the most thoroughgoing classification being that which depends on the order of the Cartesian equation. Thus the equation $x^4+y^4+z^4=1$, where x, y, z are rectangular co-ordinates, represents a surface of the fourth order, or a quartic surface. Every surface of the n th order is cut by every right line in n points, real or imaginary, and every plane section of such a surface is a curve of the n th order. But there are other important descriptive properties which may be used as bases for classification. Thus cones, which are generated by the motion of a straight line passing through a fixed point, may be of any order; and similarly cylinders, which are generated by a right line moving parallel to itself in any manner. These are special cases of the general case of what are known as *ruled* surfaces, which are generated by the motion of a right line constrained to move in some assigned manner. The theory of plane surfaces, quadric and cubic surfaces, have been fairly well worked out; but a complete discussion of quartics and surfaces of higher order has not yet been given. The more important surfaces, such as spheres and ellipsoids, are treated under separate headings. Salmon's *Geometry of Three Dimensions* and Frost's *Solid Geometry* are the best-known English works.

Surface Tension, a molecular phenomenon which appears at the boundary of two different substances, especially if one of these is a liquid. Over such surfaces effects occur which suggest that the surface is in a stretched

condition. For example, a soap bubble adhering to the rim of the pipe or funnel by which it is blown tends to contract, and, if the connected tube is not closed, will contract until it forms a film across the narrowest part. The surface tension of clean water is greater than the surface tension of dirty water; consequently, when a small portion of the surface becomes contaminated, the greater tension over the neighbouring cleaner parts draws the contaminated surface outwards, until the whole is equally dirty. This explains the difficulty of keeping a surface of water or of any other liquid perfectly clean. Surface tension phenomena also exist at the boundary of two liquids, whether these liquids do or do not mix together. In the latter case the phenomena gradually disappear as the liquids mix. The so-called cohesion figures are produced when a drop of a coloured liquid slightly heavier than water is gently dropped into the water. See CAPILLARITY.

Surf-bird (*Aphriza virgata*), a bird apparently allied to the turnstone, which is widely distributed along the coasts of America. It is brownish in colour, with white on the wings, rump, and abdomen. The surf-duck is known as the scoter.

Surgeons, COLLEGE OF. See ROYAL COLLEGE OF SURGEONS.

Surgeons, NAVAL. The first appointment of a surgeon-general to the fleet dates from 1664. Previous to 1832, medical candidates qualified for the service by an examination in surgery at Surgeons' Hall, and in physic at the office of the Commissioners for Sick and Hurt. It was not until 1843 that medical officers were given commissions. The regulations of the present day require a candidate to be a qualified medical man between twenty-one and twenty-eight years of age. There is a compulsory examination before the medical board. Then a period of training is gone through at the Royal Hospital, Haslar. The total medical strength of the royal navy was about 525 in 1905. At the end of twelve years' service as a surgeon, promotion is made after examination, to the rank of staff surgeon. Promotion to the next two grades is by selection. Then after three years' foreign service, five years' home service, or four years' mixed service, promotion is made to the rank of inspector-general. Surgeon ranks with naval lieutenant (under eight years); staff surgeon with lieutenant (over eight years); fleet surgeon with commander; deputy inspector-general with captain; inspector-general with rear-admiral.

Surgery. While the origin of surgery is prehistoric, the evolution of a great part of the modern science has taken place within the last sixty years. As in the case of medical lore, primitive surgical knowledge and skill were confined chiefly to the priesthood, and in the ancient Greek school of Kos no distinction was drawn between surgery and other branches of the healing art. Hippocrates and Celsus were both skilful surgeons, while the Alexandrian physicians and their successors, the Arabs, linked surgical methods and practice with those of medicine. Vesalius (1514-64) is sometimes styled the founder of modern surgery; but the advance that the art made in the time of Vesalius was but a part of the renaissance movement, and did not depend upon any one man. In England the early lay chirurgeons or surgeons combined their art with the humbler craft of barbers, and in 1540 the London barbers and surgeons were incorporated as one company, which survived until 1745. While bleeding remained the one and only panacea for nearly every ailment, the barber-surgeon sufficed; but as bleeding gave place to more rational and more intricate treatment, surgery grew into a science, demanding knowledge of anatomy, physiology, and pathology, as well as study of the principles of the healing art. As regards operative measures, before the introduction of anaesthetics the great desideratum was speed, and much was necessarily sacrificed to that. An amputation or a lithotomy was a matter of seconds, but the seconds held the compressed agony of hours, for the knife was an instrument of torture and the operating room a shambles. Now, however, the surgeon no longer works against time upon tortured, quivering tissues, but upon a placid, sleeping patient. Of hurry there is none, and accuracy and careful dissection have become possibilities. Even after the introduction of anaesthetics, however, in spite of the enormous advances made in surgery, the mortality after operations maintained a painfully high level. Only after Lord Lister had indicated the cause and remedy of septic conditions could surgeons operate with confidence upon the thoracic and abdominal organs, and attack the brain and the heart itself. Untoward results still occur, since individual idiosyncrasies must ever exist, but the element of chance is eliminated from the equation. Since the introduction of anaesthesia and the enunciation of antiseptic doctrines, further progress has been mainly in elaboration and

practical application of the principles involved. New anæsthetics have been introduced, many of which have for special operations advantages over chloroform. Of greater importance still is asepsis, the corollary of Lister's proposition; and surgeons now, if possible, seek exclusion rather than destruction of organisms. In many situations, however, aseptic surgery is an impossibility.

Surgical treatment of an operative nature may be necessary for (1) congenital defects, such as hare lip or club foot; (2) acquired defects, such as broken limbs or lacerated tissues; (3) the removal of foreign substances, such as bullets or calculi, from within

surgeon's primary aim is to heal, not to wound, and his operations are frequently conducted by means of splints, bandages, or other fixation apparatus, and by rest, massage, or electricity.

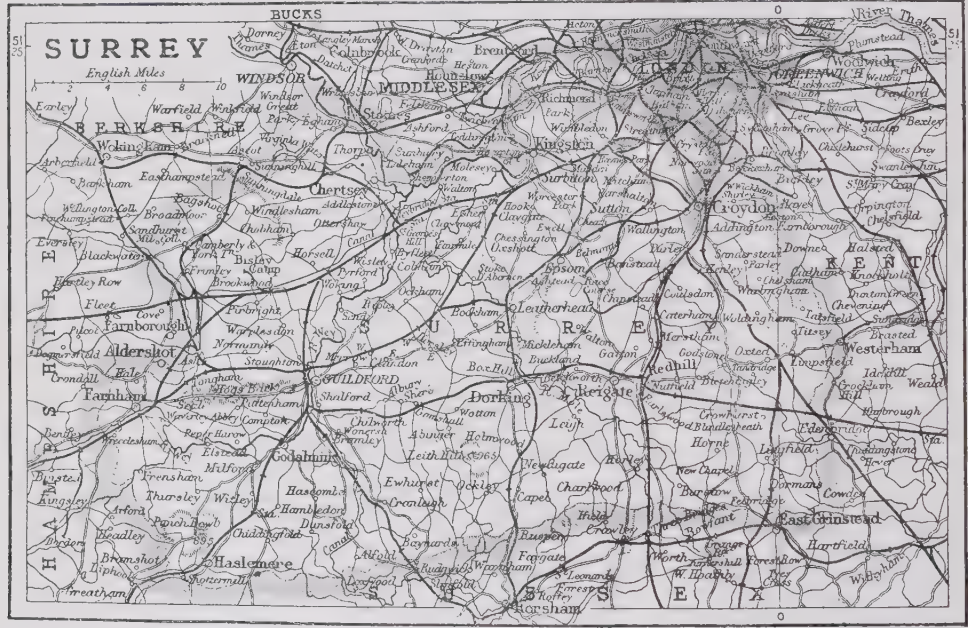
Suricate. See MEERKAT.
Surinam. See DUTCH GUIANA.

Surinam Toad. See PIPA.
Surnames. See NAMES.

Surplice, the white garment which ecclesiastics and choir singers wear when taking part in divine service. It originally reached to the feet, but was gradually shortened, probably for convenience' sake. Old brasses show the ancient English surplice to have been long and full, with long sleeves.

railway radiating from London traverse the county. Surrey returns six members to Parliament. Magna Charta was signed at Runnymede, near Egham (1215). The castles of Guildford and Farnham and ruins of Waverley Abbey are of archaeological interest. Area (admin. co.), 707 sq. m. Pop. (1901) 519,654.

Surrey, HENRY HOWARD, EARL OF (c. 1517-47), English poet, was influenced by the Italian sonneteers, and by Sir Thomas Wyatt, and introduced blank verse into English literature. In 1543 he took part in the French wars, being wounded at Montreuil in 1544, and placed in command at Guisnes and Boulogne; but in 1546 he was de-



the body; (4) the removal of diseased or injured structures, which may constitute a danger or cause discomfort to the patient, such as gangrenous tissues, malignant tumours, necrosed bones, or carious teeth; (5) the relief of conditions which threaten a patient with inevitable death, such as arterial hemorrhage, laryngeal, intestinal, or urethral obstruction, strangulated hernia, or the pressure of intrathoracic effusions; (6) the substitution of new for lost tissues, as in skin-grafting, or in the injection of paraffin in place of lost or depressed nasal bones. Thus many surgical operations do not involve the use of the knife. A

Surrey, inland co., England, s. of the Thames. Traversed e. and w. by the N. Downs (Leith Hill, 965 ft.), with many gentle eminences, vales, well-wooded parks, and large commons. The principal rivers are Wey and Mole, both flowing N. through gaps in the N. Downs to the Thames. Manufactures are carried on extensively in the vicinity of London; market-gardening and the cultivation of medicinal herbs and of flowers are widespread; hops are grown in the Farnham district; of corn-crops, oats is the chief; and a considerable area is under pasture. Fuller's earth is found at Reigate and Nutfield. Several lines of

feated at St. Etienne. In 1547 a charge of plotting for the crown was brought against him, and he was beheaded. Many of his poems were printed in *Tottel's Miscellany* (1557; ed. J. P. Collier, 1867; ed. E. Arber, 1870); *Certain Books of Vergil's Æneid* (1557; ed. Roxburghe Club, 1817); *Collected Poems* (ed. R. Bell, 1854; ed. J. Yeowell, 1866). See E. Bapst's *Deux Gentilhommes Poètes de la Cour de Henry VIII.* (1891).
Surrey, THOMAS HOWARD, EARL OF, afterwards DUKE OF NORFOLK (1473-1554), was lord admiral in 1513, when he took part in the battle of Flodden, and was created Earl of Surrey. In

1520 he was lord deputy of Ireland. He distinguished himself in the French and Scottish wars (1522). Anne Boleyn and Catherine Howard were his nieces. He was condemned to death in 1546, but the death of Henry VIII. prevented the execution, and Queen Mary restored him to his titles and estates.

Surrogates are substitutes appointed by ecclesiastical judges. They must by canon law be grave ministers and graduates, licensed preachers, or bachelors of law, or masters of arts. Under the Marriage Act, 1823, a surrogate for marriage licences must enter into a bond of £100 with the bishop to perform his duties properly. Privy Council surrogates in ecclesiastical appeals are governed by the Privy Council Act, 1843, s. 3.

Surtees, ROBERT (1779-1834), English antiquary and topographer, was born at Durham, and studied at Oxford. His chief work is a *History of Durham* (1816-40). He contributed two spurious ballads of his own composition to *Scott's Border Minstrelsy*. The Surtees Society was named after him (1834). See *Taylor's Life of Surtees* (1852).

Surtees, ROBERT SMITH (1803-64), English sporting novelist, was for some time a solicitor. His chief works are *The Horseman's Manual* (1831), *Jorrocks's Jaunts and Jollities* (1838), *Handley Cross* (1854), *Ask Mama* (1858), and *Mr. Facey Romford's Hounds* (1865). See *Memorial Sketch* prefixed to *Jaunts and Jollities* (ed. 1869).

SURVEY, COURTS OF, were constituted by 39 and 40 Vict. c. 80, now repealed and consolidated by the Merchant Shipping Act, 1894. The court consists of a judge sitting with two assessors. The judge is selected from a list comprising county court judges, stipendiary magistrates, and wreck commissioners, while the assessors are persons of nautical, engineering, or other special skill and experience. If the Board of Trade are of opinion that a ship is not in a fit condition to proceed to sea, they may detain her provisionally or absolutely, subject to an appeal by the owner or master to a court of survey. The judge, assessors, and persons appointed by the judge for that purpose have powers to survey the ship. The judge, with the concurrence of one of the assessors, may order the ship to be finally detained, otherwise she must be released.

In Scotland the sheriff is substituted for the county court judge; and in Ireland stipendiary magistrate means Dublin police magistrate, and resident magistrate.

Surveying and Levelling.

To make a survey is to take such measurements, linear and angular, as are necessary to prepare a plan, drawn to scale, which will show as far as possible all objects within the area included. Levelling is finding the relative height of certain points above mean sea-level. Plotting is the preparation of the drawings from the measurements and notes taken on the ground, whether it be survey work or levelling. Measurements are taken in feet and inches with a 100-foot chain or preferably steel band; but Gunter's chain (of 100 links = 66 feet) is frequently used, this being the most convenient unit where the area alone is required—e.g. measuring fields for crops; or where mileage is required—e.g. on a turnpike road or railway. Where, however, works have to be constructed, and quantities calculated in cubic feet and cubic yards, it is usual to work with feet entirely. For vertical heights feet only are used, and they are divided decimally into tenths and hundredths,

straight lines, but arcs. Since the plan has to be drawn on a plane surface of paper, some system of projection has to be chosen to allow of this. (See MAPS and PROJECTION.) For most engineering purposes, however, it is sufficiently near the truth to regard the surface of the earth as a plane. Plane geometry and trigonometry are then used. For more accurate work, the surface of the earth is taken as that of a sphere, and spherical trigonometry is used. On still more accurate observation the earth is found to be nearer an oblate spheroid than a sphere. The 'geoid' is the name given to the figure which has the form of the surface of the great oceans. It further has the property that at every point the surface is perpendicular to the direction of the force of gravity at that point, as indicated by the plumb-line. It will be seen from Fig. 1 how the geoid differs from the spheroid. On approaching a mountain from the sea, owing to the greater attraction of the mass of land, the

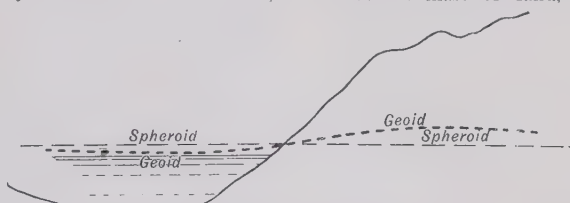


FIG. 1.

although horizontal distances are measured in feet and inches. For the English and the French or centesimal divisions of the right angle, see WEIGHTS AND MEASURES. A point from which a line or an angle is measured is called a 'station.' In the field book it is represented by Δ . The spot on the ground is frequently marked by a peg or a stone slab with a metal plate sunk in it. In small surveys the work is plotted by projecting on to a horizontal plane. This means that the distances between points at different levels, if measured on the slope, must be reduced so as to give only the horizontal distance, and the angles between two stations must be the azimuth—i.e. the angle between the vertical planes passing through the observing station and each of the observed stations.

Geodesy.—When the extent of the survey is such that, owing to the curvature of the earth, the surface of mean sea-level would differ appreciably from a plane surface, vertical projection cannot be used. The triangles are no longer plane triangles, and the lines measured are no longer

plumb-line leans towards the mountain, and consequently the geoid tends to rise there above the level of the spheroid. A survey which takes into account the true form of the earth's surface is called a 'geodetic survey.'

On account of the irregularity of the earth's surface, angles can be more easily measured than lines. Hence in geodesy it is usual to measure one base-line, and from the ends of it by angular instruments to determine stations, and from these to determine new ones, and so, by a system of triangulation, to establish stations throughout the area.

Correction of Errors.—In taking observations, say, in measuring a base-line or an angle, errors are liable to occur from various causes. After a succession of observations on the same dimension have been made, the actual figure which is to be taken as probably nearest to the true dimensions must be decided from the results of these observations. Legendre's method of least squares is what is generally employed for arriving at the required result. According to it, the sum of the squares of the

residual errors must be a minimum. When the probable dimensions have been thus obtained from the observed dimensions, they form the data from which other dimensions can be calculated trigonometrically. The accuracy of the work can be checked if a calculated dimension can be compared with the value of the same dimension as found by observation, or if a dimension as calculated from one series of observations can be compared with the value of the same dimension as calculated from a different series of observations. A geodetic survey is generally made in conjunction with astronomical work. The Ordnance Survey of Great Britain may be taken as a typical geodetic survey. The first important base-line was laid out on Salisbury Plain in 1784. It was measured three times with steel rods, glass rods, and wooden rods. The rods were carefully levelled up, were properly aligned, the adjustment of the ends was checked through microscopes, and every care was taken in observing the temperature. From the ends of this base the trigonometrical work was started. Observations were made to stations in Ireland, and when their positions were determined, the survey was similarly carried on there. As a check on this work, another base-line was set out at Lough Foyle, near Londonderry, in 1827. In this case compensating bars were used for measuring, so as to avoid the error due to changes of temperature. By means of a combination of rods, formed of metals of different expansibilities, it is arranged that the distance between the measuring-points remains constant whatever the temperature may be. The same system was used in measuring the new base-line at Salisbury Plain in 1849. This line is about 7 m. long. The distance between it and Lough Foyle is 350 m. The difference between the length of the line as measured and the length of the line as calculated from the trigonometrical work was five inches.

The lengths of the sides of the main triangles averaged over 30 m., the longest being 111 m. From these main triangles a secondary series was formed with sides of about 5 m., and from them again a tertiary series with sides of from 1 to 2 m. When this point was reached, the angular instruments were abandoned, and to fill in the topography from these stations a Gunter's chain survey was made. The lines between the last theodolite stations were measured, and new stations fixed for a chain triangulation, so that some line

ran near every point to be surveyed. As these lines were being measured, the distances at the crossings of all hedges and roads were booked, and offsets at right angles to the chain lines measured to points on the hedges, etc. The length of offset was limited to 20 links (= 13 ft. 3 in.) when the work was to be plotted to the scale of 25'344 in. to the mile, and 80 links for the 6 in. to the mile plans. In the Indian survey most of the topographical work was done with the plane-table.

Base-lines can be measured with great accuracy with a steel tape of considerable length, as has been done in the United States, or with Jäderin wires of Guillaume nickel-steel, as used on the geodetic survey of S. Africa. The distance measured at one reading is, say, 400 ft., and the tape is supported at short intervals on the tops of pegs driven into the ground, so as to be in line and at one gradient, but not necessarily at one level. The difference of level between the extreme ends is found by levelling from one to the other. The expansion of steel with heat is considerable; but when the coefficient for the tape has been determined, the necessary correction can easily be made. The chief difficulty is in observing the temperature of the steel, and cloudy weather should be chosen for doing the work, as then few variations are likely to occur.

In the Ordnance Survey work the country has been levelled over, and on the plans contour lines are shown, and also ground levels are given at indicated spots on roads. These levels were worked in lines across the country in different directions, and at places where the lines cut one another the correct level was reduced from the various observed readings by the method of least squares. Bench marks ∇ were cut on buildings, gate-posts, etc., at intervals along the lines levelled over, and the values of these in feet and decimals are printed on the maps. The datum to which all levels are reduced is mean tide-level at Liverpool. This is called Ordnance datum, and in reality is eight inches below mean sea-level. In Ireland, Ordnance datum is the level of a point fixed on Poolbeg lighthouse in Dublin Bay, and is the low-water level of spring tides. For the scales of the published maps and plans, see ORDNANCE SURVEY.

Linear Measurements.—To measure lengths with the chain or steel band requires two men—the 'leader' and the 'driver' or 'follower.' The leader, taking

one handle of the chain and eleven arrows (steel wire skewers), goes forward towards a pole set up at the station to be chained to. The driver keeps his handle of the chain at the starting-station, and directs the leader so that the chain lies in the straight line between the two stations. The chain is then drawn tight, and the leader puts an arrow in to the ground to mark the point to which his handle reaches. He then advances with the chain another length towards the station, and the driver comes forward to the arrow in the ground and holds his end of the chain there, whilst the leader puts his second arrow at his end of the chain when it is in line and drawn tight. When the leader has put in his last (eleventh) arrow, the driver gives him the ten he has picked up, so that the leader can proceed once more. Where the ground is uneven, the chain must be held out horizontally, and a plumb-line used to find the point to put in the arrow. Where accurate work is required, a steel band should always be used in place of a chain.

Angular measurements are taken with the theodolite. See THEODOLITE.

Measuring distances with the Tacheometer.—A tacheometer has all the parts of a theodolite for measuring angles, and in addition



Platinum-iridium
Stadia Points.

FIG. 2.



Glass Stadia
Diaphragm.

FIG. 3.

the telescope has an extra lens—the anallatic lens—and a stadia diaphragm, as in Figs. 2 and 3. In measuring distances, a staff graduated in feet and decimals is held vertically at the point whose distance from the instrument is required. The telescope is directed to the staff, and by means of the slow motion screw on the vertical arc one of the stadia lines is made to coincide with any exact foot on the staff. The amount of staff then included between the stadia lines multiplied by 100 is the distance in feet to the staff. Some instruments are provided with a diaphragm having a movable line and a micrometer scale at the side. The distance of the staff from the instrument is equal to the micrometer reading multiplied by the length of staff enclosed between a fixed line and the movable line of the diaphragm. In this case the staff is held horizontally, as the adjustable line is vertical, and the micrometer milled head is turned till, say, ten feet of the staff arc

enclosed between the lines. If the telescope is inclined considerably from the horizontal while taking a stadia reading on hilly ground, the vertical angle must be booked, that the true horizontal distance may be deduced.

In arranging the positions of stations, it should be seen that the triangles formed are 'well-conditioned'—that is to say, one side should not be either very long or very short, compared with the others. The lines to be measured between the stations should be conveniently situated for including the objects to be surveyed. Check measurements either of lines or of angles should be taken.

Geometry of Surveying (Fig. 4).—The position of one point in a plane with reference to any other point is determined by two conditions—either (1) two distances, as in Cartesian co-ordinates (x, y), or (2) by one distance and one angle, as in polar co-ordinates (r, θ). In surveying the position of P with reference to O, it would be determined either (1) by measuring the length from O along some base line OX to the point where the

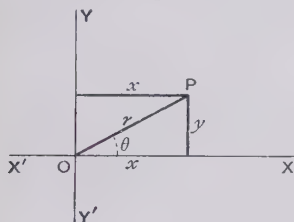


FIG. 4.

perpendicular from P falls on O ($=x$), and the distance to P at right angles to that line ($=y$); or (2) by measuring the angle POX ($=\theta$) and the direct distance of P from O ($=r$). The first is the method of offsets as practised in a chain survey; the second is the method when using an angular instrument, such as a box sextant, theodolite, or prismatic compass. If there are many points to be fixed, all at such short distances from some straight line that the right angle of the perpendicular from them can be guessed with sufficient accuracy by eye, the first is a rapid and accurate method.

The following example of a field-book (Fig. 5) and the plotted result (Fig. 6) shows a piece of work naturally plotted this way. The line is chained from A to B, and the distances are booked in the centre of the page from the bottom upwards. The offset distances are booked at the sides on which they occur. The method of polar co-ordinates is most rapid with a tachometer, since the distances as well as the angles can

be measured. The following example of a field-book and the plotted result (Fig. 7) shows a

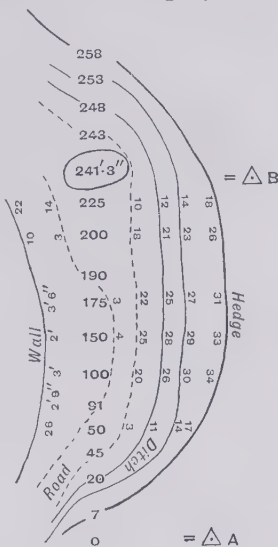


FIG. 5.

piece of work surveyed by this method.

A *traverse* is a survey of a series of stations, each one of which is fixed from the last by (1) the dis-

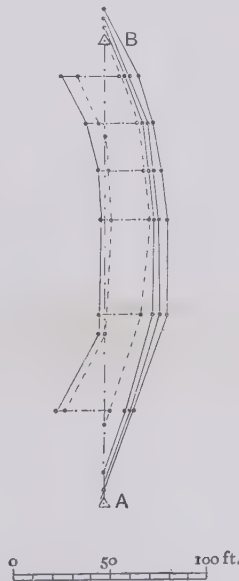


FIG. 6.

tance from the last, and (2) the angle which that measured line makes with the last measured

line. It is a case of surveying by polar co-ordinates, the pole being each of the stations successively. If from the last of the stations so fixed the first of the series can be similarly sighted upon and measured to, then a 'closed traverse' has been made, and the accuracy of the work can be checked. This can be done either by testing if the work can be plotted, or, preferably, by calculating the Cartesian co-ordinates—*viz.* $x = r \cos \theta$ and $y = r \sin \theta$, from the lengths and bearings of the lines. If the bearings of the lines are taken with reference to a fixed direction (say north), instead of measuring each included angle independently, it is simple to find the co-ordinates, or 'northing and easting,' or 'latitude and departure,' or meridian and perpendicular, with a table of logarithms or with a slide rule. In a closed traverse the sum of the northings should equal the sum of the southings, and similarly with the eastings and westings. But errors are as likely to occur in plotting as in surveying. Moreover, paper

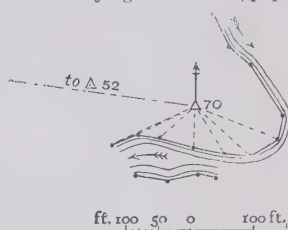


FIG. 7.

expands and contracts to such an extent with change of humidity that, unless the work is all plotted

*Field Book from which the River,
Fig. 7, was plotted (from actual
survey).*

From A 70.

Distance.	Bearing.	Remarks.
	278° 9' 30"	To A 52.
142	245° 30'	River right bk.
102	244° 50'	Water's edge.
77	231° 10'	—
65	185° 0'	—
86	149° 0'	—
117	133° 20'	—
140	112° 10'	—
139	96° 40'	—
106	52° 40'	—
108	23° 0'	—
146	8° 40'	—
143	220° 20'	River left bk.
123	202° 30'	—
108	180° 30'	—
114	165° 0'	—

at one time, it is hard to get lengths to check. Under by no means extraordinary conditions paper will alter '2 per cent. The

method of tabulating the co-ordinates of a closed traverse (Fig. 8) is shown below.

In many cases a closed traverse cannot be made, as in the survey of the route of a railway line, or aqueduct, or road. In this case the only check on the dis-

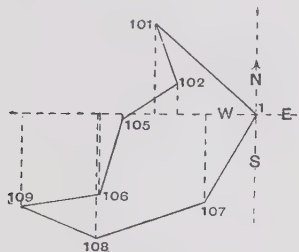


FIG. 8.

tances must be by a repetition of the chaining. The angles can be checked by taking an astronomical observation to determine the meridian (true north or true south) at one end of the line, and working through the survey with the

the curve has. It is usual to fix points on the curve at regular equal distances—say one chain or half a chain apart—and to set out points between these by eye.

Transition curves are sometimes used at the ends of circular curves to lessen the abruptness of the change of direction from the straight. True spirals are not in favour on account of the trouble in setting them out. The length of the transition curve is generally two chains—viz. one chain on each side of the original tangent point. The circular curve, instead of being set off from the original tangent point, is set off at a distance from it equal to $4d$, d being the offset from the tangent to the circular curve in one chain length.

Instruments.—Angular instruments are of three kinds. (1.) *Direct reading*, in which the telescope is directed first to one station and then to the other, as theodolite or plane-table. (2.) *Magnetic*, in which the angle observed is that between the station sighted and the direction

directions from the point A. The distance from A to B is then chained, and the distance scaled

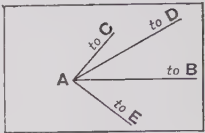


FIG. 9.

on the paper along the direction line AB and B so fixed. The table is moved to A B, and set so that the line BA points to A, and

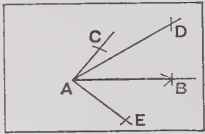


FIG. 10.

from the point B on the paper direction lines are drawn as before to the other A's. The intersec-

Closed Traverse, Fig. 8, with Co-ordinates worked out (from actual Survey).

Line.	Stations.	Bearing.	Angle beyond Right Angle.	Length.	N.	S.	E.	W.	Totals.			
									N.	S.	E.	W.
	Δ 1								0	0	0	0
Δ 1— Δ 107	107	209° 25' 0"	29° 25' 0"	752' 0"		655.1		369.3	655.1			369.3
107— 108	108	251° 31' 0"	71° 31' 0"	833' 6"		264.3		790.5	919.4			1159.8
108— 109	109	291° 23' 30"	21° 23' 30"	619' 3"	225.8			576.6	693.6			1736.4
109— 106	106	80° 51' 0"	80° 51' 0"	593' 6"			585.9		599.2			1150.5
106— 105	105	17° 24' 20"	17° 24' 20"	582' 0"	555.4		174.1		43.8			976.4
105— 102	102	55° 32' 0"	55° 32' 0"	471' 6"		266.8	388.7		223.0			587.7
102— 101	101	338° 51' 0"	68° 51' 0"	496' 6"	463.0			179.1	686.0			766.8
101— 1	1	131° 48' 20"	41° 48' 20"	1028' 9"		635.8	766.8		0.2			0.0
Length of traverse.....				5377' 0"	1605.4	1605.2	1915.5	1915.5				

bearings so found to the other end of the line, and there making a second observation to determine the meridian. Working with an ordinary theodolite of 5 in. diameter horizontal plate, true north can be found from a star to within half a minute.

To determine the meridian from a fixed star.—A few hours before the star crosses the meridian (the time being found from the *Nautical Almanac*) an observation of it is taken, the horizontal angle and vertical angle on the instrument being noted. When, after passing the meridian, the star is once more at the same altitude, the horizontal angle is read. The bisector of the horizontal angle between the first and second observed positions of the star gives the position of its maximum altitude—i.e. its crossing of the meridian.

Curve ranging generally has reference to railway lines, and in most cases circular arcs are used. Other curves, however, can be set out by making use of the particular mathematical properties which

indicated by the compass needle, as miners' dial, prismatic compass. The theodolite generally has a compass attached, but angles are not dependent on it. (3.) *Reflecting*, in which by means of mirrors the two stations viewed are seen in the same direction. The actual angle between the stations (double the angle between the mirrors) is shown by a pointer on a scale—e.g. sextant, box sextant, range finders, optical square.

Plane-table (Figs. 9, 10).—With the plane-table the work is plotted in the field, and a survey is made in which the angles, instead of being read in degrees, are sighted directly on to the paper, and the lengths between the stations are scaled and plotted as soon as they are measured. A board with the paper stretched on it is set on a tripod, fitted with levelling screws as in a theodolite. It is set up over a Δ A and levelled up, and a point is marked on the paper to represent the Δ. The directions of various Δ's and prominent objects from A are sighted, and lines drawn on the paper radiating in these

tion of these lines with those drawn from A determine new Δ's and objects. The plane-table is most frequently used for rough preliminary work where rapidity is of greater importance than accuracy of detail. It can be used with great success along with a telescope having stadia webs. The distances to objects are read with the telescope, and the directions to them sighted on the plane-table, and their positions plotted at once. Theodolite angles are read, booked, and plotted; while plane-table angles are plotted direct, thus escaping two sources of error. Plane-table work should be plotted to a large scale, and if necessary reduced, but never enlarged.

Prismatic Compass.—In the prismatic compass (Fig. 11), as in the mariner's compass, the card is attached to the needle, but the graduation is in degrees and minutes. The instrument is set up over a Δ, and pointed along the line whose bearing has to be taken. When viewed through the prism, the sighting vane is seen

in line with the Δ flag, and at the same time the portion of the compass card immediately beneath the prism can be seen in reflection, so that the bearing of the direction in which the instrument is pointing can be read. Prismatic compasses of small size are used without a stand, being merely held in the observer's hand.

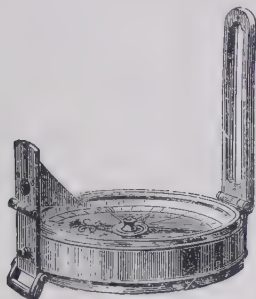


FIG. 11.

Box Sextant.—The principle of the box sextant is shown in Fig. 12, where a is a fixed glass, the lower half of which is transparent, whilst the upper half is reflecting; and b is a mirror which can be turned to any angle by means of a milled head. To use the instrument, b is turned so that the reflected image of a flag at B is seen in the mirror portion of a so as to be in line with a flag at A as seen through the clear glass of a . A vernier in connection with b moves along a scale of degrees, so that the angle between A and B can be read off.

The sextant is not so much the surveyor's instrument as the navigator's, by whom it is regularly used to observe the altitude of the sun, so as to determine latitude and longitude when at sea. (See SEXTANT.)

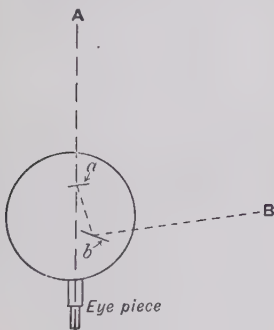


FIG. 12.

Photographic surveying has hardly been tried in Britain except for experimental purposes. The negative gives the surveyor

all the points to which, with a plane-table, he would draw direction lines. It can be used alone on preliminary work, but it is of most assistance for filling in details from the main theodolite stations, in addition to those determined by other methods.

LEVELLING for survey work is generally done with a surveyor's level and staff. The level (Fig. 13) consists of a telescope, to which is attached a sensitive spirit-level. The telescope is mounted on a vertical axis, which can be adjusted exactly as in the case of a theodolite. When so adjusted that, on turning the telescope round on its axis, the spirit-level bubble keeps in the centre of its run, all points viewed through the centre of the telescope are on the same horizontal plane. A diaphragm (Figs. 14, 15) near the eye-piece, as in the theodolite, shows the line of collimation. The staff is the graduated scale which is sighted through the level, and is marked in feet and decimals.

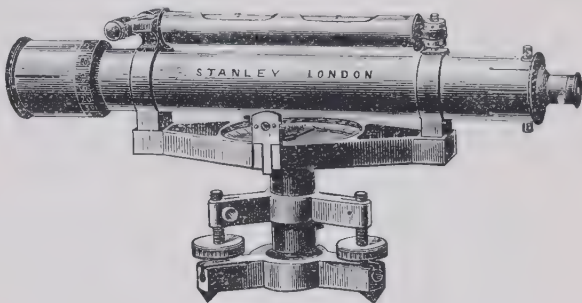


FIG. 13.

The method of levelling is as follows:—The instrument is set up and adjusted by means of the levelling screws. The staff is held on the point taken as datum, and the reading on it seen through the telescope gives the height above datum of the collimation of the telescope. If the staff be then held successively on various points whose levels are required, the reading seen through the telescope will in each case give the distance of that point below the collimation; and hence its height above datum, or 'reduced level,' is known. By sending the staff forward and taking the forward reading (or 'fore sight') so as to determine the reduced level of this 'turning-point,' and then carrying the level beyond the staff and taking a 'back sight' on the staff, still held on the turning-point, so as to determine the new collimation level, and repeating this series of operations, levels may be carried any distance. With this system of levelling, horizontal distances do not come into the calculations.

With an angular instrument, however, as a theodolite, if the vertical angle be read and the horizontal distance be measured, the rise (or fall) from the instrument to the turning-point will be $L \tan \theta$. If the distance be taken with a tachemeter, with the stadia staff held vertically, the true distance $L = \text{reading} \times \cos^2 \theta$; \therefore the rise (or fall) = reading $\times \cos^2 \theta \tan \theta$, = reading $\times \sin \theta \cos \theta$. Thus, with the tachemeter in one operation the position on plan and also the elevation of a point are found. If the accuracy attained with a level is required, the tachemeterical calculations appear rather troublesome; but with logs they can be easily worked out. For taking ground levels where it is not required to read to hundredths of a foot the necessary reductions can be made by slide rule, and for taking spot levels over steep or uneven country no method approaches this for the rapidity

with which a contour plan can be prepared. The calculations are greatly simplified if the vertical arc, in place of being divided into degrees, is graduated at angles whose natural $\sin \times \cos$ are 0.01, 0.02, etc.—0.59, 0.60, as proposed in *Proc. Inst. C.E.*, vol. cxxxix. p. 277. When the staff is read, the telescope is set so that



FIG. 14.



FIG. 15.

one of these divisions agrees with the index; and consequently the telescope is inclined at an angle whose $\sin \times \cos \times 100 = 1, 2, 3$, etc., as the case may be.

To make a *section* (Fig. 16), levels are taken along a line at all points where the slope of the ground alters, and the distances along the line at these points are booked. These levels and dis-

tances are then plotted in conjunction, the distances being scaled along a horizontal datum line, while the levels at these points are scaled as ordinates from the datum line. Sections are frequently plotted with one scale for the horizontal lengths and another for the vertical heights, since levels are generally of much more importance than horizontal lengths.

be pegged off, and the positions of these pegs surveyed by any of the ordinary methods. A series of cross-sections of the ground may be taken, and when these are plotted the positions on plan where a particular level occurs on each section give a series of points on a contour. Spot-levels may be taken at points of prominent change of form on the ground, and the positions of

by calculation with the slide rule, or plotted direct with an adaptation of the lazy tongs, as described in *Proc. Inst. C.E.*, vol. cxxix. p. 278. In Great Britain levels are referred to Ordnance datum, and are taken from some Ordnance bench mark convenient to the works.

A clinometer, since it is for measuring vertical angles, is a levelling instrument. Instead of having a spirit-level to show the horizontal line, it has a plumb-bob to show the vertical line. By means of the barometer, levels (approximate) can be taken, and aneroid barometers are frequently used for this purpose for preliminary work over unmapped, rough country.

See G. W. Usill's *Practical Surveying* (8th ed. 1904); L. D. R. Jackson's *Aid to Survey Practice* (1889); Middleton and Chadwick's *Treatise on Surveying*, pt. I. (2nd ed. 1904); H. M. Wilson's *Topographic Surveying* (1900); J. B. Johnston's *Theory and Practice of Surveying* (1900); A. R. Clarke's *Geodesy* (1880); M. Merriman's *Elements of Precise Surveying and Geodesy* (1899); W. F. Stanley's *Surveying and Levelling Instruments* (1901); J. O. Baker's *Engineers' Surveying Instruments* (1897); E. Deville's *Photographic Surveying* (1895); and Gillespie's *Treatise on Surveying* (1901).

Surveyors' Institution, a society incorporated by royal charter, originated for the purpose of enhancing the position of the surveying profession, and facilitating acquisition of the knowledge necessary for its practice. The institution has nearly 4,000 members.

Surya, one of the two names by which, in Hindu mythology, the sun is known. In the *Rig-veda* he is generally represented as a car-drawn deity and wedded to Ushas, or the Dawn. He is also the source of life, and watches closely the actions of men. There is a female Surya, sometimes spoken of as a feminine personification of the sun. The Surya hymn is descriptive of her wedding with Soma, the moon.

Suryasiddhanta, Sanskrit work on astronomy. An English translation by E. Burgess and W. D. Whitney was published in 1860 in the *Journal of the American Oriental Society*; another in 1861, at Calcutta, by Bāpū Deva Śāstrin. Biot held that the Hindus derived their system of astronomy from the Chinese, while Prof. Weber was of opinion that the Hindu system is much more ancient than that of China.

Sus, or SUSA, seapt., Tunis, N. Africa, on Gulf of Hammamet, Mediterranean Sea, 32 m. by rail E.N.E. of Kairwan; produces grapes and olives. Pop. 12,000.

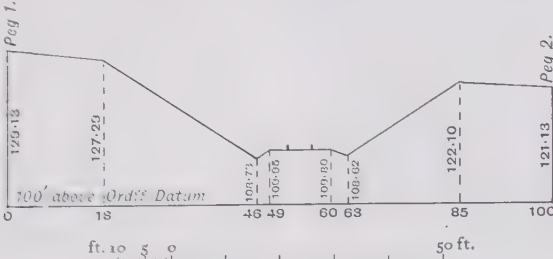


Fig. 16.

A contour line on a plan is a line every point on which is at the same level. From a plan with contour lines drawn at equal vertical heights apart, a very good idea of the form of the country can be grasped. A con-

these surveyed and marked on the plan, with their levels written against them. Between any two such spot-levels the intervening contour points are interpolated. This method entails least work in the field, and, especially

Level Book from which Section, Fig. 16, was plotted.
Levels reduced by Method of 'Collimation.'

Back Sight.	Inter- mediate Sight.	Fore Sight.	Collimation Level.	Reduced Level.	Dis- tance. Feet.	Remarks.
8-37			132-67	124-3		Ord. B.M. on gate-post.
5-16		4-39	133-44	128-28		Turning-point.
	4-31			129-13	0	Ground level at peg 1.
	6-15			127-29	18	Top of slope.
2-63		13-59	122-48	119-85		Turning-point.
	13-75			108-73	46	Bottom of slope.
	12-53			109-95	49	Ballast.
	11-96			110-52	52	On rail.
Continuation of same Section. Levels reduced by Method of 'Rise and Fall.'						
			Rise. Fall.			
	11-96			*110-52	52	On rail.
	11-94		02	110-54	57	On rail.
	12-63			109-80	60	Ballast.
	13-86		1-18	108-62	63	Bottom of slope.
S-37		4-07	9-79	118-41		Turning-point.
	4-63		3-69	122-10	83	Top of slope.
	5-65		07	121-13	100	At peg 2.
			13-50	*110-52		
			2-89			
			10-61	10-61		

* The arithmetic can be checked by noting that the difference between the sum of the rises and the sum of the falls is equal to the difference between the first and last reduced levels.

tour plan is of great value for preliminary work—for example, for fixing the line of a road or railway, or for choosing a site for laying out works or buildings. By means of a level and staff a series of points on a contour may

in irregular ground, is much the quickest. With a tachometer the levels and positions of the spots can be taken at one observation. The interpolation of the lines between the spot-levels is most accurately done either

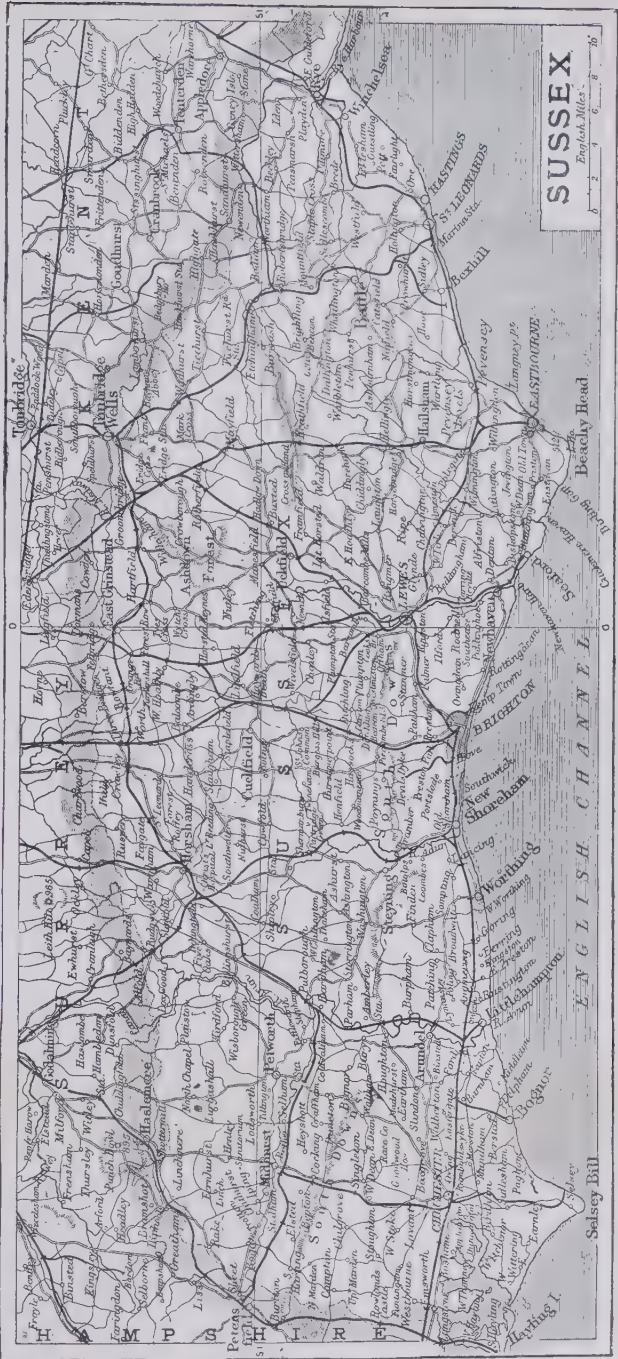
Susa, or **SHUSHAN** (of Daniel), chief city of prov. Susiana in ancient Persia; it stood on the E. bk. of the Choaspes (now Kherkha). Darius Hystaspes is said to have been its founder; it was a favourite residence of the ancient Persian kings. On the site (now called Sûs) ruins and cuneiform inscriptions have been found.

Susanna, **HISTORY OF**, a short book of the Apocrypha, forming, with *Bel and the Dragon* and the *Song of the Three Holy Children*, what are known as the apocryphal additions to Daniel. It tells of one Susanna, the wife of Joakim, resident at Babylon during the exile, as having been solicited to unchastity by two elders, who, having been repelled, conspire to accuse her of the same sin, they having been witnesses. Susanna is condemned to death, but is saved by Daniel, who, cross-questioning the elders separately, shows their evidence to be contradictory, whereupon they are put to death. The narrative may be a late elaboration of Jer. 29: 22 f. It is unlikely that the original was in Hebrew, but scholars differ as to whether it was in Greek or in Aramaic. See commentaries cited under **APOCRYPHA**.

Suspension Bridges. See **BRIDGE**.

Susquehanna, riv., U.S.A., rises in two main branches—north branch, in S. New York; and west branch, in W. Pennsylvania. After circuitous courses through the valleys of the Appalachians they join at Sunbury, Pa., below which the river flows nearly S. to its mouth, at the head of Chesapeake Bay. The length, following the north branch, is 422 m.; the entire drainage basin is 27,655 sq. m. It is navigable to Port Deposit.

Sussex, maritime co., England, on English Channel. The coast is generally low and uniform. Many watering-places are studded along the coast—Hastings, Eastbourne, Bexhill, Seaford, Newhaven, Shoreham, Brighton, Worthing, Bognor. The S. Downs traverse the southern part of the county, terminating in Beachy Head (Linchball, 818 ft.; Ditchling Beacon, 813 ft.). The centre is occupied by the Weald, a wide undulating tract formerly covered with forest. The principal rivers are Rother, Ouse, and Arun, with W. Rother, flowing to the English Channel. Chalk and clay are quarried, and natural gas is obtained at Heathfield. Nearly two-thirds of the cultivated area is under pasture. Large numbers of sheep are grazed (the Southdown breed being noted), and cattle are fattened. The area under woods and planta-



tions is greater than in any other English county, except Hants. Sussex is divided into two administrative counties, East and West. It returns six members to Parliament. The Romans had many stations in the district, which later formed the kingdom of the S. Saxons. Within its borders were fought the battles of Senlac (1066) and Lewes (1264). Antiquities include earthworks (Cissbury Ring, Chanetonbury), castles (Arundel, Lewes, Hurstmonceaux), monastic buildings (Battle Abbey, Bayham). Area (anc. co.), 1,459 sq. m. Pop. (1901) 605,202, of whom 274,904 were males, and 330,298 females.

Susten Pass, a Swiss Alpine pass (7,422 ft.), which leads from Meiringen in the Hasli or Upper

highly cultivated. The main part of the county consists of moorland, rough hill-grazing, and deer forests, with lofty mountains and rugged valleys to the N. and W. The Atlantic shores are bold and rugged, Cape Wrath, in the N.W., reaching a height of 523 ft.; and there are numerous indentations (e.g. Kyle of Tongue and Loch Eriboll). Ben More Assynt and Ben Clibrigg reach elevations of 3,273 ft. and 3,154 ft. respectively. There are numerous lochs (Shin, Assynt). The salmon and herring fisheries are important. Dornoch, a royal burgh, is the county town. Dunrobin Castle, on the coast near Golspie, is the seat of the Duke of Sutherland. The county returns one member to Parliament. Brochs and towers indi-

It rises in Lakes Manasarowar and Rakastal in W. Tibet, 15,200 ft. above the sea, and enters the Punjab at its eastern extremity. Flowing almost due W., it receives the Beas and, farther on, the Chenab. After a course of about 900 m. it joins the Indus at Mithankot, S. of Multan. It is navigable for steamers as far as Firozpur.

Sutras, in Sanskrit, collections of rules which form the basis of teaching in religious ritual, grammar, and ceremonial customs; and also in the various systems of philosophy, each of which has its text-book written in Sutras.

Suttee. See SATI.

Sutton Coldfield, munic. bor., Warwickshire, England, 7 m. N.N.E. of Birmingham. In the parish church is an effigy of Vesey (or Harman), bishop of Exeter (d. 1554), a native of this place, to which he was a munificent benefactor. There is a new town hall (1904). In the vicinity is a picturesque park (2,400 ac.), the gift of Henry VIII., secured by Bishop Vesey, and much frequented by the people of Birmingham. Pop. (1901) 14,264.

Sutton-in-Ashfield, tn., Nottinghamshire, England, 3 m. W.S.W. of Mansfield. The church of St. Mary Magdalene dates from the 14th century, and includes part of a 12th-century building. There are a town hall (1890) and a free library (1898). Hosiery is manufactured, and there are collieries in the district. Pop. (1901) 14,862.

Sutures, or stitches in surgery, are used to close wounds and to unite divided tissues. Where there is much tension deep sutures may be necessary, and these may be of a special kind, such as Lister's 'button' suture. In some positions the material used must be capable of absorption after it has kept the parts in apposition sufficiently long to allow of union. Catgut and other animal textures fulfil this condition. In other cases the stitch may consist of silk, horsehair, or wire; but these have to be removed subsequently. Materials which are more or less rigid—wire and horsehair, for example—act to some extent as splints, and secure rest as well as union of the injured parts.

Suvorov, or SUWARROW, ALEXANDER VASILIEVITCH (1729-1800), Russian general, who rose from the ranks, and never was defeated, even by Napoleon. He was born at Moscow. Having distinguished himself in the Seven Years' war, he was assigned high command in the Polish campaign of 1768-71. He then defeated the Turks in the First Turkish war (1773); crushed the revolt (1775) of Pugatchev and of the Caucasian tribes (1780); drove the



Sutherlandshire.

Aar valley to Wassen, on the St. Gothard Ry. It thus affords the most direct communication between the Bernese Oberland and that line.

Sustentation Fund. See FREE CHURCH OF SCOTLAND and UNITED FREE CHURCH.

Sutherland Falls, celebrated waterfall (1,904 ft.), near Milford Sound, N.Z.

Sutherlandshire, maritime co., north of Scotland, bounded on S.E. by Moray Firth and on N. and W. by the Atlantic, covers an area of 2,028 sq. m. It is the wildest and least densely populated county in Scotland. Out of a total population of 21,440 (1901) nearly 14,100 speak Gaelic and English. The shores of the Dornoch Firth are fertile, and are

cate Pictish occupation, but early in the 11th century the county became Scandinavian, and remained Norse till its annexation to the Scottish kingdom. Prior to 1810 all the available cultivable land in the county was held by small crofters, who led a most precarious existence; between 1810 and 1820 many of the crofts were converted into sheep-walks, and the crofters were removed to the coast or assisted to emigrate to Canada. Between 1873 and 1878 large tracts of land were cleared and reclaimed, especially at Lairg and Kildonan, at the expense of the Duke of Sutherland.

Sutlej, one of the five rivers of the Punjab, India, from which the province derives its name.

Turks back in the Second Turkish war (1789) from Fokshani, the river Rymnik, and the stronghold of Ismail; stormed Praga in the second Polish campaign, and induced the surrender of Warsaw (1794). He was then sent to help the Austrians against the French in Italy, and gained a series of brilliant victories over Moreau, Joubert, and Macdonald. He then crossed the Alps, with terrible sacrifice of men, and met Masséna at Schwyz, but was too weak to accept battle, and retreated into Austria. See *Life* by Spalding (1890).

Suwalki, or **SUVALKY**, *tn.*, cap. of gov. of same name, Russian Poland, 75 m. N.W. of Grodno, a centre of timber and grain trade. The government covers an area of 4,846 sq. m., and has a population (1897) of 604,945, chiefly engaged in agriculture, timber-felling, and the weaving of linen and woollen cloth. Pop. (1897) 22,646.

Suwanee, *riv.*, Florida, U.S.A., rises in S. Georgia, and flows 240 m. s. to the Gulf of Mexico; navigable to White Springs. It is the Swanee River of the popular song, 'The Old Folks at Home.'

Suzdal, *tn.*, Vladimir gov., Central Russia, 22 m. N. of Vladimir city. The Cathedral of the Nativity, founded by St. Vladimir in the 10th century, partly reconstructed in 1528, ranks among the most famous Russian churches. There are also an episcopal palace and kremlin; market-gardening, tanneries, tallow foundries, cloth, calico, and cotton manufactures. Pop. (1897) 8,000.

Suzerain, a feudal overlord. The modern use of the word signifies the overlordship of one power over another, as that of the Porte over its tributary states.

S.V., *Sancta Virgo*, Holy Virgin; also *sub voce*, 'under the heading.'

Svastika, a symbol of unknown origin, and early introduced into India, apparently in connection with sun-worship. It appears either as a cross in a circle—thus, ⊕—or as a cross with the arms bent at right angles—thus, ⊞. The latter symbol is found in heraldic and ecclesiastical work in Christian countries, as well as in the catacombs, and is known as the fylfot. Mediæval mystic writers derived it from the Greek gamma, which they thought suggestive of Christ as the corner stone; but it is seen on objects exhumed at Troy by Dr. Schliemann, and in early Indian and Chinese art; also in Mexico and Peru.

Sveaborg, *tn.*, fortress, and seaport, of Nyland prov., Finland, 4 m. S.E. of Helsingfors city, on islands in the Gulf of Finland.

Constructed in 1748-70 as a Swedish Gibraltar, it was taken by the Russians in 1808, and unsuccessfully bombarded by the Anglo-French fleet in 1855.

Svearike, or **SVEALAND**, a division of Sweden, comprising the city of Stockholm and the counties of Stockholm, Upsala, Södermanland, Westmanland, Örebro, Vermland, and Kopparberg.

Svendborg, *tn.*, Funen, Denmark, 29 m. by rail S.E. of Odense, on Svendborg Sound. Its two churches date from the 13th century. It is a shipbuilding centre. Pop. (1901) 11,543.

Svendsen, **JOHAN SEVERIN** (1840), Norwegian musical composer, was born at Christiania; became conductor of the musical association in Christiania, and since 1883 has been court conductor at Copenhagen. His compositions include a symphony and other orchestral works, chamber music, concertos for violin and for cello, and songs. One of his best-known works is his beautiful *Romance* for the violin.

Sverdrup, **JAKOB** (1845-99), Norwegian politician, was in 1878 elected a member of the Storting, where he joined the Radical party. In 1884 he entered the administration of his uncle Johan as minister of public worship. On the formation of the Hagerup coalition ministry, in 1895, he became the leader of the Moderates. On quitting the ministry, in 1898, he was made bishop of Bergen.

Sverdrup, **JOHAN** (1816-92), Norwegian politician, was born at Jarlsberg; elected to the Storting in 1851 as a Radical member, and eventually became (1871-72) leader of the peasant separatist party. As president of the Storting he played a very prominent part in securing the presence of ministers in the Storting, and in overriding the king's claim to an absolute veto upon its proceedings. In 1883 he became prime minister, but resigned in 1889.

Sverdrup, **OTTO** (1855), Norwegian Arctic explorer, born at Haarstad in Helgoland; joined Nansen's expedition over the Greenland ice-fields in 1888, and was chosen by Nansen as captain of the *Fram* for his North Pole expedition. When Nansen, on March 14, 1895, quitted the *Fram* in order to make his way to the Arctic circle by sledge, Sverdrup undertook the leadership of the expedition. In 1898-1901 he led a second expedition in the *Fram*, and discovered several islands (Ringnes, Axel Heiberg, King Oscar Land) between Greenland and the Parry Isles and Melville I. The expedition is described in his *New Land* (Eng. trans. 1904).

Sverre (1151-1202), king of Norway, a native of the Faroe Is., was proclaimed king in 1177. His masterful attitude towards the higher clergy caused him to be excommunicated in 1194, and Innocent III., in 1198, laid the whole land under an interdict. Sverre, throughout the whole of his reign, was at war with various pretenders and rebels, of whom the most dangerous was the popular faction known as the Bagler, whom he finally subdued in 1201-2.

Svetchine, **MADAME**. See **SWETCHINE**.

Swabia, duchy of Germany, existed from the beginning of the 10th to beyond the middle of the 13th century, and corresponded generally to Württemberg, Baden, and S.W. Bavaria.

Swaffham, *mrkt. tn.*, Norfolk, England, 12 m. S.W. of Dereham. The church of SS. Peter and Paul is an ancient flint edifice with 16th-century embattled tower. Pop. (1901) 3,371.

Swaheli, a mixed Arab-Bantu people of Zanzibar and the opposite mainland between Mombasa and the Rufiji R. All are Mohammedans, with a measure of culture due to Arab influences. The language, which, thanks to their enterprising spirit as traders, caravan-leaders, and carriers, has become the chief medium of intercourse throughout E. Central Africa, is of Bantu structure, but is full of Arabic words and expressions. It is written both with the Arabic and the Roman alphabet, and has been carefully cultivated and largely used by Protestant and Roman Catholic missionaries. See J. L. Krapf's *Elements of the Kiswahili Language* (1850), and *A Dictionary of the Swahili Language* (1882); Bishop E. Steere's *Swahili Exercises* (1882).

Swallow, or **CHIMNEY-SWALLOW** (*Hirundo rustica*), a passerine bird, belonging to the family Hirundinidae, which includes the swallows and martins, birds which are not related to the swifts, in spite of the superficial resemblance. Both swallows and martins are characterized by the short and wide bill, which is deeply cleft, with a very wide gape, and a mouth which opens to about the line of eye; the narrow, elongated wings; the small, weak feet; and the forked tail. They are cosmopolitan in distribution, and feed upon insects, which are taken on the wing. The family is represented in Britain by three species—the chimney swallow, the martin (*Chelidon urbana*), and the sand martin (*Cotile riparia*). The chimney swallow nests throughout Europe, the more northerly parts of Asia, and northern Africa. In winter it

extends throughout Africa, and through India to Burma and the Malay Archipelago. The swallow arrives in Britain towards the end of March. But the slaughter to which the birds are subjected on migration, both for the table and for the sake of their plumage, is greatly diminishing the numbers which arrive. From the British area migration usually begins early in September, and most of the birds have gone by the middle of October. On the other hand, the fact that stragglers have been seen throughout the winter months affords an explanation of the old myth, believed in by White of Selborne, that swallows hibernated in Britain. The adult male chimney swallow has in summer the throat and forehead chestnut; the upper parts, together with a band on the breast, steel blue; while the under surface is white or pinkish. In flight it is readily distinguished from the house martin by the absence of the white rump. The nest was originally, no



Swallows.

doubt, built in caves, but is now usually placed about buildings. It is constructed of mud, mingled with short straws and lined with hair and feathers, and is shaped like a half-saucer. The eggs are from four to six in number, and there are two or three broods; but where there is a third brood it frequently happens that the young are not reared. The birds feed upon gnats and crane-flies, and are thus true friends of man. In addition to the chimney swallow there are a number of other species of the genus *Hirundo*, as the very large mosque swallow (*H. senegalensis*) of Africa. In the eastern parts of the Mediterranean occurs the red-rumped swallow (*H. rufula*). See also MARTIN.

Swallowing, or DEGLUTITION, is a complicated action whereby food or liquid is carried from the mouth to the stomach. Within the oesophagus the bolus is involuntarily carried downwards by peristaltic movements of the muscular fibres. Deglutition is voluntary only so long as the food is in the mouth. When the

bolus has passed the palatine arch the act becomes reflex, and is controlled by a nervous centre in the medulla oblongata. Swallowing can thus be performed during unconsciousness. The stimulus for the reflex part of the act is the presence of food or liquid in the pharynx, or at the root of the tongue.

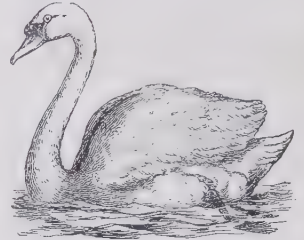
Swallow-wort, a name given to plants of the genus *Asclepias*. They bear umbels of flowers, and are for the most part climbing plants with herbaceous habit. Among the species are *A. stipitata* and *A. Cornuti* (the Virginian swallow-wort), the young shoots of which are sometimes eaten like asparagus. *A. incarnata*, *A. tuberosa* (the butterfly weed), and *A. curassavica* (the wild ipaecacanha) are among the species valued for their medicinal properties.

Swami, a title originally used to indicate the Supreme Being; subsequently it was applied to idols, leaders of religious thought, priests or men of rank. It is now used, among Tamil and Telugu Hindus, as a respectful form of address, synonymous with 'Mr.' or 'Sir'; sometimes it is part of a name—e.g. Rama Swami.

Swammerdam, JAN (1637-80), Dutch naturalist and entomologist, was born at Amsterdam. He devoted himself to natural history, especially to the dissection of insects. He was author of a *General History of Insects* (1792) and a *History of the Day Fly* (1681). He was a disciple in religion of the mystic Antoinette Bourignon, whom he followed to Holstein.

Swan (*Cygnus*), a genus of birds belonging to the family Anatidae, whose members are characterized by their long necks; the naked patch between the eye and the beak (lores); the fact that the sexes are alike in plumage; and the predominance of white tints, except in the Australian swan. Three species of swans occur within the British area. The tame or mute swan (*C. olor*) has the front part of the bill orange, while the lores and the large basal tubercle are black. There is a variety known as the Polish swan. The bird is distributed throughout Europe, and extends into Asia, but through much of the area it is not truly wild. In Britain there is a very old swannery at Abbotsbury in Dorsetshire, while in the domesticated condition the bird is widely spread. The other two British swans, both only occasional visitors, are Bewick's swan (*C. bewicki*) and the whooper or whistling swan (*C. musicus*). The latter is about the length of the mute swan, and is distinguished by having the front part of the

bill black and the basal portion yellow. The bird is essentially an Arctic species, and has a loud note. Bewick's swan is a much smaller species, and may be distinguished by the fact that the basal yellow patch on the bill



Mute Swan.

does not extend below the nostrils, as it does in the previous species. Of other species mention may be made of the two North American swans, *C. columbianus* and the trumpeter (*C. buccinator*). Very different from other species in colour is the pure black swan (*Cygnus* or *Chenopsis atrata*) of Australia and Tasmania, which has a very short tail and the scapular and inner secondary feathers curled. Swans are all birds of powerful flight, and are more or less gregarious in habits. Though frequenting fresh water in summer, they are often found at the sea in winter. They seem to pair for life, and place their large, untidy nests upon the ground near water. Their food consists largely of water plants, but also of insects and molluscs. The note is loud and trumpet-like, the windpipe in many species being curiously folded. Even the so-called mute swan trumpets in the wild state.



Black Swan.

Swan, ANNIE S. (1860), otherwise Mrs. Burnett Smith, Scottish novelist, born at Gorebridge, near Edinburgh; published her first novel, *Aldersyde*, in 1883, and has since written a large number of healthy popular novels, among which the most notable are *Carlowrie* (1884), *Gates of Eden* (1886), *The Curse of Cowden* (1897), *St. Veda's* (1899), *Christian's Cross* (1905); *Love, the Master-*

key (1905); and *A Mask of Gold* (1906). She is the principal contributor to and editor of the *Woman at Home*. She married Dr. Burnett Smith, a London physician.

Swan, JOHN MACALLAN (1847), English sculptor and painter, born at Old Brentford; studied painting under Gérôme in company with Bastien Lepage and Dagnan Bouvery, and sculpture under Frémiet. He began to exhibit in the Royal Academy in 1878; two years later his *Prodigal Son* was bought for the Chantrey collection (Tate Gallery, London). In 1894 he was elected A.R.A., and in 1899 member of the Royal Water-colour Society. A special exhibition of his studies was held at the Fine Art Society's Gallery in 1897. He is the finest English sculptor of animals in his suggestion of their essential character, structure, and movement. His paintings are poetically treated, with a fine sense of colour. See Baldry's *Drawings of John M. Swan* (1905).

Swan, JOSEPH (1791-1874), English anatomist, studied under Sir Astley Cooper; practised as a surgeon till 1827, then devoted himself to anatomy. Among his works are *Demonstration of the Nerves of the Human Body* (1830); *New Method of making Dried Anatomical Preparations* (3rd ed. 1833); *Observations on the Nervous System* (1822).

Swan, SIR JOSEPH WILSON (1828), English inventor, was born at Sunderland; founded the firm of Mawson and Swan, and increased the rapidity of photographic dry plates by heating the emulsion. Later he patented the carbon or autotype process of obtaining permanent photographic prints, and invented bromide paper and several photo-mechanical processes. Swan's name is, however, best known in connection with the invention of the incandescent electric lamp, which he first exhibited in 1879. He was knighted in 1904.

Swan, KNIGHT OF THE. See LOHENGRIIN.

Swanage, wat.-pl. and seapt., Dorset, England, on Swanage Bay, S.E. of Isle of Purbeck. A pier 1,400 ft. long (1896) is accessible by vessels at all states of the tide. Purbeck stone is quarried, and fancy straw goods are made. Pop. (1901) 3,048.

Swanetia, ancient division of Caucasus, named from the Svans, Strabo's Suani.

Swan River. See AUSTRALIA.

Swansea, seapt. tn., munic., co., and parl. bor., Glamorgan-shire, Wales, at the mouth of the Tawe, 60 m. W.N.W. of Bristol; is the chief seat of the tinplate manufacture, and one of the most

important copper smelting and refining towns in the world, and has extensive coal mines. Its docks cover 60 acres. On July 20, 1904, King Edward VII. laid the foundation stone of the 'King's Dock,' which is to cover 66 acres, and is to be completed by 1910. Swansea is the seat of a suffragan bishop, and sends two members to Parliament. Its parks include Victoria Park. Pop. (1901) munic. and co. bor. 94,514.

Swanwick, ANNA (1813-99), English philanthropist and writer, interested in the higher education and enfranchisement of women. She translated Goethe's *Faust* and Schiller's *Dramas*, also the tragedies of Æschylus. Her best known original works are *Poets the Interpreters of their Age* (1892) and *Evolution and the Religion of the Future* (1894).

Swastika. See SVASTIKA.

Swatow, seapt. tn., Kwangtung prov., China, on I. bk. of Han, 5 m. from its mouth, and 180 m. N.E. of Hong-kong; has been open for foreign trade since 1869, though for long it had an unenviable reputation for anti-foreign feeling. Sugar is largely exported, and considerable trade is done in tea, paper, tobacco, beans, and bean-cake. In 1904 the exports were valued at over £2,500,000, and the imports at £5,000,000. Pop. 48,000.

Swaziland, a South African native state, E. of the Transvaal. Area, 8,000 sq. m.; pop. (1904) 85,484 natives and 898 Europeans. The Lebombo mountains lie on the E. Its independence was guaranteed in 1884. The Swazis are a warlike Kafir tribe, and were the allies of Great Britain in the Sekukuni and Zulu campaigns. Much of the land is excellent for grazing, and workable gold mines exist.

Swearing is the making affirmation of a statement or fact by an appeal to a supernatural power. Profane swearing, which is here specially under consideration, consists (1) in the hasty, irreverent, and thoughtless use of a solemn asseveration or of an ejaculatory prayer, or (2) in giving vent to a heartfelt and deliberate malediction. The ideal wicked man of the Psalmist is described as one who 'clothed himself with cursing as with his garment,' and delighted not in blessing. The essence of profanity is desecration. It is pointed out by Mr. A. B. Cook (*Folklore*, xvi. 261) that when the Romans swore by the sky-god Jupiter they were required to do so with no covering above them but the sky; otherwise the oath was profane. Similarly, the words 'Mon Dieu,' 'Mein Gott,'

'My God,' which are pious apostrophes when used in prayer, become profane when used heedlessly in conversation; although custom has almost deprived the expression of all meaning in France and Germany. Minor deities, such as the patron saints of countries, cities, families, and guilds, were frequently sworn by. William the Conqueror's favourite oath, 'By the splendour of God!' has had its congeners in 'God's mercy!' 'God's blood!' (corrupted into 'Sblood'), 'God's wounds!' ('Zounds,' 'Zoons,' and 'Oons'), 'God's death!' ('Sdeath'), and 'God's nails!' ('Snails'), the last four referring to the crucifixion and the nails of the cross. 'Od's-bodykins!' or 'Bodykins!' and 'Gadzooks!' have a like origin. The blood and wounds of Christ further gave rise to the adjectives 'bloody' and 'woundy,' the latter now obsolete, although the former is in daily use, but no longer in polite society. The desire to distinguish between a solemn oath and a mere ejaculation, or an emphatic expression (perhaps also a feeling of shame) has led to the refining away of the original word, as in several of the above instances. For this reason the name of God appears under such disguises as Gad, 'Od, Dod, Gosh, Govey, Gol, Golly, and Goles; while Lord has changed into Lor', Law, Lud, Lo'd, Losh, Lawks, and Land (as in 'Landsakes!'-U.S.A.). 'By God!' has assumed the forms 'By Gad,' 'Bead,' 'Egad,' and (in Ireland) 'Bedad' and 'Begorra.' The interjectional appeal to the Virgin Mary, which is spelt 'Marie!' by Chaucer, has long been written 'Marry!' It still survives in some parts of England. Formerly, profane swearing was a custom of lords and ladies, as indicated by Shakespeare, when he makes Hotspur call upon Lady Percy to 'Swear me, Kate, like a lady, as thou art, a good mouth-filling oath,' and to leave to citizens and their wives such milk-and-water protestations as, 'In good sooth,' 'As true as I live,' and 'As sure as a day.' Both in English and in Scottish law profane swearing is a statutory offence, punishable by fine.

Swcat. See PERSPIRATION, SKIN.

Sweating Sickness, or MILIARY FEVER, is a disease characterized by pyrexia, profuse sweats, and an eruption of miliary vesicles or sudamina. At one time it was epidemic over a large part of Europe, and was very fatal in Britain in the 15th and 16th centuries. From time to time slight epidemics still occur in Picardy and in the north of

Italy. More rarely sweating sickness is of a malignant type, and is accompanied by high temperature, with delirium, extreme prostration, and hæmorrhage. In such cases death may occur almost at the onset of the fever. The epidemics of the middle ages seem to have assumed this malignant character.

Sweating System, a term commonly applied to any unduly severe conditions of labour, and especially when the wage paid to the worker is utterly insufficient for the work performed. The influx of poor aliens from

To emphasize the extent of the evil, a sweated industries exhibition was held in London the same year.

Sweden embraces the eastern and larger part of the Scandinavian peninsula, and is bounded on the E. by the Baltic and the Gulfs of Finland and Bothnia. While Norway is a rugged mountain land, Sweden on the whole forms a great plain, very slightly elevated above sea-level. Only the northern part along the Norwegian border is mountainous. The highest Swedish peaks are in Lappmark, where Kebnekaise rises to 7,005 ft. and Sarjeltjokko to 6,970 ft. The coast formation is much simpler than that of Norway; but, on the other hand, Sweden possesses a much more highly developed Skärgård (skerries grounds) or outer island formation than the sister kingdom. The innumerable islands which fringe her shores, affording as they do protection against winds and waves, are of the utmost importance to navigation. Sweden abounds with useful minerals. Extensive layers of iron ore, especially magnetic iron, are found in Dannemora and other parts of the country; copper ore exists at Tunaberg and Falun, zinc ore on the shores of Lake Wetter, and lead and silver ore at Sala. Sweden, like Norway, is exceedingly well watered. The principal rivers are the Torneå, Kalix, Luleå, Piteå, Umeå, Angerman, Ljusna, and Mottala, falling into the Baltic; and the Göta and Klar, flowing into the Kattegat. Of the numerous canals, connecting the rivers and lakes, by far the most important is the Göta Canal, which, by means of the Göta R. and the lakes Wener and Wetter, unites the German Ocean with the Baltic. A peculiar feature of Swedish scenery is the quantity of lakes, covering 8·3 per cent. of the total area. After the Russian lakes Ladoga and Onega, Lake Wener, 144 ft. above sea-level and 2,150 sq. m. in extent, is the largest lake in Europe.

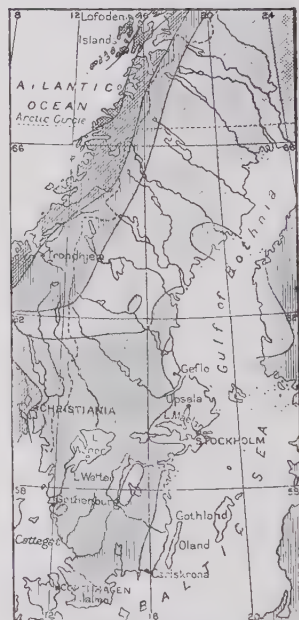
Sweden belongs to the Atlantic climatic zone. The rainy season is the late summer and autumn. In Lappmark, the northernmost district, the flora is of an arctic character, firs and pines predominating. The beech first appears in the province of Småland. The reindeer is nomadic in the extreme north. Stags and elks are rare. The lemming migrates as far north as 62° N. lat. The salmon is the principal river-fish. Sweden has an area of 172,876 sq. m. The population, 5,136,441 in 1900, has more than doubled since 1830. The great majority of the population are rural, only 22·2 per cent.

living in the towns, of which only two, Stockholm and Gothenburg, have more than 100,000 inhabitants. The Swedish people form a branch of the Germanic race, and are closely akin to the Danes and Norwegians. The three Scandinavian languages, moreover, very closely resemble each other. Besides the Swedes, there are about 20,000 Finns and 7,000 Lapps in the country. The established religion is the Evangelical Lutheran, but absolute liberty of worship is allowed. Ecclesiastically, Sweden is divided into thirteen dioceses, the archbishop of Upsala being the pri-



Sweden—Contours.

the Continent to our larger cities, and their willingness to work for low wages, as also the necessary circumstances of numbers of women workers, have allowed unscrupulous employers to force upon employes, more especially those doing work at their own homes, conditions of labour and wages quite inadequate for daily wants. Inquiries, government and charitable, have brought to light the widespread nature of the sweating system, especially in the metropolis, and the Aliens Act which came into operation on Jan. 1, 1906, is one attempt to deal with the root of the evil.



Sweden—Rainfall.

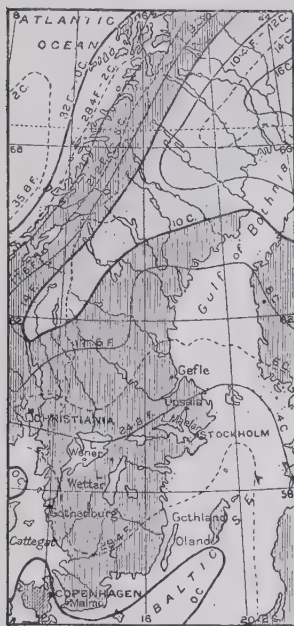
mate. The Swedish people are well educated; perambulatory schools exist in sparsely populated districts. There are two universities—one at Upsala and one at Lund—besides the Caroline Institute at Stockholm for higher medical studies, and a technical college at the same place. Agriculture occupies about three-fourths of the population, although the greater part of the land (50·9 per cent.) is still covered by forest, and the quantity of good arable land only amounts to 8·7 per cent. of the whole area. The greater part of the land is owned by small pro-

priators. Barley is largely cultivated beyond 70° N. lat. Oats is exported mostly to England. Rye is the staple food of the people. The potato flourishes everywhere. Great progress has been made in cattle-breeding, and large quantities of butter (in 1903 £1,108,980), hides, wool, bacon, and live stock are exported. The forests yielded timber and wood-pulp to the value of £6,158,400 exported in 1903. The fisheries are important, particularly the herring fisheries. Mining, however, is the most productive of the Swedish industries. Excellent iron ore is found in the central provinces, and at Gellivare and Luossavare in Lappmark, the total output in 1903 being

bers (250) of the Second Chamber are elected by the town and country districts. On a peace footing the active army consists of about 40,000 men. A peculiar feature in the Swedish military forces is the 'Indelta,' the privates of which are paid and maintained entirely by the large landowners, and in proportion to the extent of their estates. Each soldier in this force receives a cottage in addition to his pay as long as he continues to serve. Since the severance from Norway the forts along the Norwegian frontier have been rearmcd and thoroughly brought up to date. See Sundbärg's *Sweden* (1905).

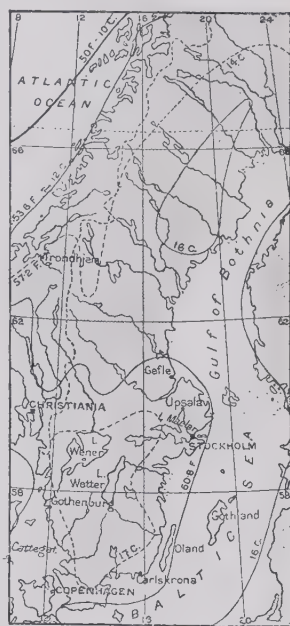
History.—Sweden proper was inhabited in ancient times by two closely related races (Sver and Goter), from whose conjunction the Swedish nation ultimately arose, and whose early kings, of the Ynglingar family, reigned at Upsala. Christianity was first preached in Svealand by St. Ansgar in the middle of the 9th century; but the old heathen religion obstinately persisted for more than two centuries and a half later. Alternate Swedish and Gothic dynasties ruled the land till 1250. During this period Finland was conquered and Christianized. Under the Folkungar dynasty (1250-1397) both the nobility and the clergy extorted considerable privileges from the impecunious monarchs; and finally the dominant aristocracy, resenting the efforts of King Albert of Mecklenburg to strengthen the monarchy at their expense, invited against him the aid of Margaret of Denmark, who united the three Scandinavian kingdoms beneath her sceptre by the union of Kalmar (1397). This union with Denmark and Norway, under kings of German extraction and arbitrary inclination, soon became intolerable both to the nobility and to the people. Rebellions were frequent; native monarchs were even elected in defiance of the union; and the attempt of Christian II. of Denmark to extirpate the Swedish magnates (Stockholm Bloodbath, 1520) led to a general rising under Gustavus I. of the Vasa family, who, in 1521-3, shook off the Danish yoke, and was elected king at the Strenghäns Riksdag (June 7, 1523). Peace was subsequently made with Denmark by the Malmö Recess (Sept. 1, 1524), the latter kingdom retaining the southernmost provinces of Sweden and the island of Gotland. Gustavus's financial embarrassments led him to break with the Roman hierarchy, which possessed most of the land; but the introduction of Protestantism was gradual, and at first encountered a stubborn resistance. The Synod of Örebro

(1529) marks the turning-point in the struggle. Gustavus devoted himself during the latter part of his reign to the rehabilitation of his impoverished country, and a stable government was ensured by a compact at Vesterås (1544), which made the throne hereditary in Gustavus's family. Gustavus's two sons, Eric XIV. (1560-8) and John III. (1568-92), succeeded him consecutively. Both of them were weak rulers with papistical tendencies and vague ambitions, which involved them in abortive wars with Denmark and Russia. John's son and successor, Sigismund (1592-9), who was brought up a Roman Catholic, and had become king of Poland five years before his accession to the Swedish



Sweden—January Isotherms.

3,677,520 tons. Woollen and cotton goods are the principal manufactured products. The annual production of spirits is valued at £1,133,500. Excellent harbours abound. The principal exports are timber, wood pulp, butter, paper, iron and steel, and matches. The total value of the imports in 1902 was £28,066,500; that of the exports, £21,798,500. Sweden is a limited hereditary monarchy. The nation is represented by the Riksdag, consisting of two chambers of equal authority. The members (150) of the First Chamber are elected by the provincial councils and special representatives of the large towns for nine years. The mem-



Sweden—July Isotherms.

throne, was ultimately expelled from the kingdom by his uncle, Charles IX., the youngest son of Gustavus I., and a bigoted upholder of Protestantism, a capable if cruel prince, who reigned from 1599 to 1611. It was through his instrumentality that the Synod of Upsala (1593) confirmed and completed the reformation in Sweden, and it was the dream of Charles's life to be the leader of a great Protestant league. But he was unfortunate as a statesman, and when he died he bequeathed to his son, Gustavus Adolphus (1611-32), three pending wars, with Denmark, Poland, and Russia respectively. The Danish war was terminated by the peace

of Knäred (Jan. 1613), which made no territorial change. Much more lucrative to Sweden was the peace (Feb. 27, 1617) whereby Russia ceded Kexholm and Ingria, and was thus excluded from the Baltic for a century to come. The war with Poland dragged on, however, till 1629, when, by a six years' truce, Livonia and E. Prussia were provisionally surrendered to Sweden. It was then that Gustavus espoused the cause of the Protestants in Germany. In less than two years he crushed the forces of the Catholic League, notably at Breitenfeld; delivered the hardy-pressed Protestants in the Rhenish provinces; and had penetrated into the heart of Bavaria, when Wallenstein's invasion of Saxony compelled him to hasten back to defend that kingdom, only to fall victorious on the field of Lützen (Nov. 16, 1632). It was no vision of an imperial crown, as some have supposed, that tempted Gustavus to invade Germany. The hegemony of Sweden in the north was undoubtedly the object of his policy, and what is called Sweden's epoch of greatness is generally dated from the year 1617, when the Swedes gained possession of both sides of the Baltic. Though cut off prematurely, Gustavus at least saved the Protestant cause in Europe; while his domestic and military reforms, which practically created a strong centralized government in the hands of a capable council of magnates and soldiers, with a complaisant Riksdag behind them, enabled Sweden to proceed on the path of conquest for at least another century.

The minority of Gustavus's daughter and successor, Christina (1632-54), was made famous by the masterly statesmanship of the great chancellor Axel Oxenstierna, and the victories of the Swedish generals Banér, Torsensson, and Wrangel. Sweden reaped her reward at the peace of Westphalia in 1648, when Upper Pomerania, with the adjacent islands, Wismar, and the bishoprics of Bremen and Verden practically gave her the control of all the great German waterways, except the Vistula. Sweden was now the leading Protestant power in Europe, especially after the crushing defeat which Denmark drew down upon herself by a gratuitous invasion of Swedish territory in 1643, which cost her (peace of Brömsebro, 1645) the provinces of Halland, Herjedal, and Jemtland in the Scandinavian peninsula, and the islands of Ösel and Gotland in the Baltic. In 1654 Christina resigned the crown to her cousin, Carl Gustaf, a grandson of Charles IX., and he reigned as Charles X. from 1654 to 1660, and astounded all Europe

by his military exploits, which aimed at realizing the ambitious dreams of Gustavus II., and making the Baltic a Swedish Mediterranean. The first Danish war (1657-8) was terminated by the peace of Roeskilde (1658), whereby Denmark was compelled to cede to Sweden all her remaining Swedish provinces, as well as the province of Trondhjem in Norway and the island of Bornholm. The refusal of Denmark to enter a pan-Scandinavian league led to a second war between the two kingdoms, when Charles's designs were frustrated by the heroic defence of Copenhagen. Poland, too, was more easily beaten in battle than permanently conquered. Nevertheless, by the peace of Copenhagen (1660), Sweden relinquished Trondhjem and Bornholm, but retained all her other conquests from Denmark, thus gaining for the first time her true geographical boundaries in the Scandinavian peninsula. Peace with Poland was concluded by the treaty of Oliva (May 3, 1660), which definitively ceded Esthonia and Livonia to Sweden.

During the long minority of Charles XI. (1660-72), who was only four years old at his father's death, the government of Sweden was in the hands of magnates whose policy was wasteful at home and vacillating abroad. During this period Sweden was dominated by France, who induced her, in 1675, to plunge into a disastrous war with Brandenburg and Denmark, whence she only emerged without territorial loss in consequence of the energy and heroism of the young king, and the active diplomatic intervention of triumphant France at the peace of St. Germain in 1679. During the remaining eighteen years of his reign Charles devoted himself to crushing the influence and pruning down the estates of the nobility, who had enriched themselves at the expense of the crown. His methods were often cruelly severe, and hundreds of noble families were ruined; but the nation at large, which benefited by the new economical system, supported the king throughout. The prosperous condition in which he left his realm at his death (1697) materially assisted the martial enterprises of his heroic son Charles XII. That monarch has too often been regarded as a heroic swash-buckler, who for twenty years wantonly disturbed the peace of Europe. As a matter of fact, war was forced upon him by a combination of Russian, Saxon, and Denmark. Charles's radical defect as a ruler was his utter contempt of diplomacy (instilled into him by his father),

which repeatedly prevented him from taking advantage of favourable conjunctures. His sudden and violent death in 1718 saved Sweden from utter ruin, though not from dismemberment, and it was the business of his successors, Ulrica Leonora (1718-20) and Frederick (1720-51), to compound as best they could with their numerous foes. Bremen and Verden were ceded to Hanover in 1719; Hither Pomerania, as far as the Peene, to Prussia, by the peace of Stockholm (Feb. 1720); and Ingria, Esthonia, Livonia, Karelia, and part of Kexholm to Russia by the peace of Nystad (Sept. 10, 1721). Sweden now dropped to the rank of a second-rate power, but during the wise and pacific twenty years' rule of the chancellor, Count Arvid Horn, she gradually recovered from her wounds.

The period between 1719 and 1772 is called by Swedish historians the 'period of freedom,' because it was a violent rebound from the absolutism of Charles XI. and Charles XII. to a strictly constitutional régime, the supreme authority being vested in the Riksdag, or Parliament, composed of four estates—nobility, clergy, burghesses, and peasants—sitting in separate chambers. During the interval between Riksdag and Riksdag the country was governed by the senate. Throughout this period royalty in Sweden was degraded into a mere state decoration. Matters were not improved in 1738 by the rise of the notorious 'Hats' and 'Caps'—the former a martial party in the pay of France, the latter a pacific party leaning first to England and latterly to Russia. The violence and venality of these two factions eventually reduced Sweden to a condition of anarchy not unlike that of moribund Poland, and it was therefore with the hearty approval of the nation at large that Gustavus III. (1771-92) swept away both factions by the bloodless *coup d'état* of August 1772, immediately afterwards reinstating the Riksdag, but modifying the constitution in a monarchical sense, though the power of the purse and other important privileges were expressly reserved to the estates. The Gustavian era was in some respects the most brilliant period of Swedish history. Gustavus did much for literature and the arts, and his ingenious if somewhat adventurous foreign policy, and his successful wars with Denmark and Russia, did much to raise the prestige of Sweden in the eyes of Europe. On the other hand, his extravagance, flightiness, and above all his impolitic if chivalrous espousal





of the Bourbon cause against revolutionary France, led to many entanglements. His assassination, in March 1792, was a blunder as well as a crime, and during the disastrous reign of his semi-imbecile son, Gustavus IV. (1792-1809), Sweden embarked on a ruinous war with Russia, which ultimately resulted in the loss of all Finland and the Åland Is. Farther Pomerania, her last continental possession, was ceded to Prussia five years later, but by the peace of Kiel (Jan. 14, 1814) she was compensated thereby by the union with Norway under one king. On the death (Feb. 1818) of the last king of the old line, Charles XIII., brother of Gustavus III., the throne passed to Charles John (formerly the French general Marshal Bernadotte), who had been elected heir to the throne by the Örebro Riksdag (Aug. 25, 1810). The crown is now hereditary in his family.

Since 1815 Sweden has ceased to exercise any influence upon European politics. Only her relations with Norway are of importance. Briefly, these relations have turned upon the efforts of Norway to break away from the union. The secession was peacefully accomplished in the autumn of 1905. (See NORWAY.) The principal domestic event during this period was the reform of the constitution on June 22, 1866, when the representation by estates was abolished, and the existing constitution was established. Only twice during the last sixty years has Sweden intervened in foreign politics. The first occasion was during the war between Denmark and the German Bund in 1848, when Sweden prepared to take part in the campaign on the Danish side, but was prevented by the conclusion of the truce of Malmö. The second occasion was at the time of the Crimean war, when, in November 8, 1855, a treaty was concluded with the western powers, whereby they guaranteed the integrity of the Scandinavian kingdoms; but the sudden conclusion of peace at Paris put an end to any idea of Sweden's active participation in the war.

See Montelius's *Civilization of Sweden in Ancient Times* (Eng. trans. 1888); Hildebrand's *Das heidnische Zeitalter in Schweden* (1873) and *Sveriges medeltid* (1879, etc.); Weidling's *Schwedische Geschichte im Zeitalter der Reformation* (1882); Schinkel's *Minnen ur Sveriges Nyare Historia* (1855-83); Mankell's *Öfversigt af Svenska Krigens Historia* (1890); Oscar II.'s *Några Bidrag till Sveriges Krigshistoria* (1859-65); Geijer's *Svenska Folkets Historia* (1832-36); Carlson's *Sveriges Historia* (1855-87); Fryxell's *Berättelser*

ur Svenska Historien (1832-80); Malmström's *Sveriges Politiska Historia* (1855-77); Montelius, Hildebrand, Alin, and others' *Sveriges Historia* (1902, etc.); Thomas's *Sweden and the Swedes* (1898), and Baker's *Pictures of Swedish Life* (1894).

Literature.—It is not till the middle of the 17th century that we meet with anything that can be seriously regarded as literature, for the runic verses found on ancient monuments are of purely archaeological interest, while the literary activity which centred round St. Bridget (1303-73) and the monastery of Vadstena is of a purely religious character. After the reformation the University of Upsala was suffered to decay, and the Swedish gentry flocked to Wittenberg and Rostock for an education denied to them at home. Nevertheless the reformers, by their translation of the Scriptures, fixed, once for all, the form and character of the Swedish language. It was George Stjernhjelm (1598-1672) who first 'taught the muses how to play and sing in the Swedish tongue.' His ballets, or operatic sketches, such as *Then Fångne Cupido*, amused Queen Christina's court. Bröllopsbesvär's *Ingkom-melse*, the work of his old age, displays many of the qualities of a powerful humorist. The path opened up by Stjernhjelm was pursued by his friend and biographer Samuel Columbus (1642-79), and by Peter Lagerlöf (1648-99), accounted the best religious poet of his day. Then followed a period of decline, during which Swedish literature fell beneath the pernicious influence of Marini and his German imitators. The vagaries of this school flourish most luxuriantly in the bombastic odes of Dahlstjerna (1658-1709). Amidst the jarring babel only one faint but sweetly pathetic note strikes the ear—Jacob Frese's lyrics. A salutary change was effected by the rude and vigorous *Satir mot våra dumma poeter*, by Samuel von Triewald (1688-1743), the earliest Swedish satirist, and the dramas of Count Carl Gyllenberg, Johan Stagnell, and R. G. Modée (1698-1750), the two former being largely influenced by Swift, Addison, and Wycherley, and the latter by Molière. It was, however, in Dalin (1708-63) that the English influence produced its best fruits. Dalin's *Svenska Argus* is a close and clever, though inferior, imitation of Addison's *Spectator*. As a poetic satirist, too, notably in *Avrilverk* and the masterly *Saga om Hästen*, obviously suggested by Swift's *Tale of a Tub*, Dalin also did excellent work; but his plays are inferior to Gyllenberg's. On the other hand, his *Svea Rikes Historia* was the

first serious attempt at a critical history of Sweden in popular form. The chief pioneer of the French school in Sweden was Hedwig Carlotta Nordenflycht, the directress of the 'Society for the Promotion of the Poetic Art in Sweden,' whose little house at Stockholm became the favourite resort of the *élite* of Swedish society—a sort of anticipation in miniature of Madame Geoffrin's salon at Paris with a more romantic colouring. Conspicuous among its frequenters were two poetical young noblemen, Count Philip Creutz (1729-85) and Count Gustaf Fredrik Gyllenberg (1731-1808). Creutz speedily won renown by his exquisite pastoral poem, *Atis och Camilla*; while Gyllenberg's beautiful descriptive idylls—*Vinterqvådet* and *Vårqvådet*—are still read and admired.

With the accession of Gustavus III. (1771) the classical period of Swedish literature begins. Gustavus, himself a man of brilliant parts and strong histrionic instincts, is the author of seven plays, most of which still keep the stage. One of them, *Sri Brahe* (1788), is not only the royal playwright's masterpiece, but is also by far the best original acting drama which the Swedish theatre possessed until quite modern times. Amongst the talented writers of the first rank whom the gifted young monarch discovered and promoted were the witty J. G. Oxenstierna (1750-1818), a gay and graceful society poet, and the author of the descriptive idylls *Dagens Stunder* and *Skördarne*, and the playfully mock-heroic legend *Disa*; the Voltairean Kellgren (1757-95), 'the glory and delight of the Gustavian era,' and master of style, who, as editor of the *Stockholm Post*, exercised for fourteen years an indisputable dictatorship over the national literature; and Leopold (1756-1829), also a critic and satirist of note, whose didactic tales, descriptive idylls, and moral odes, after being extravagantly belauded by his contemporaries, have been as unduly disparaged by a later age. Oxenstierna, Kellgren, and Leopold were the chief representatives of the classical school which looked to France for its models. But along with, though independent of, the classical school, a purely national school of literature was springing up, whose chief exponents were Bellman, Lidner, Hallman, and Kexel. Bellman (1740-95), not merely the greatest of the Gustavian poets, but one of the few great lyric poets of modern times, was of a genius closely akin to that of Robert Burns, though it is difficult for any one but a Swede to

appreciate, still less to define, his peculiar genius. Lidner's (1759-93) was a vagabond talent of great force and pathos. Hallman (1732-1800) enjoys the distinction of founding a purely national comic drama in Sweden. Kexel (1748-96) was a more graceful but far less original dramatist than his friend Hallman, and his historical tale *Zamaleski* is remarkable as being the first Swedish novel. More difficult to classify is that child of revolt the eccentric Thorild (1759-1808), who had the audacity to attack the oracle Kellgren, and who seems utterly unable to express his often sublime and pregnant ideas in anything like fairly intelligible language.

The formalism introduced into Swedish literature by the classical school was at last successfully combated by the protagonists of the rising romantic school, Askelöf (1787-1848) and Atterbom (1790-1855), the latter the author of *Fågel Blå* and *Löcksalighetens Ö*, in their respective journals *Polyfem* and *Fosfor*. These so-called Phosphorists included in their ranks the critic Hammarskjöld, the romance writer W. F. Palmblad, and the poet and novelist K. F. Dahlgren. Two independent poets of the same period are the lyricist F. M. Franzén (1772-1847) and J. O. Wallin, Sweden's best hymn-writer and most eloquent preacher. Another illustrious group of writers and thinkers formed about this time the Gothic Union, whose chief aim it was to cultivate and idealize old Scandinavian literature and heroic tradition, and which numbered in its ranks the poet and historian Geijer (1793-1847), the poet Esaias Tegnér (1782-1846), author of *Frithjofs Saga*; Beskow, the chivalrous apologist of Gustavus III.; and Lindeblad. Quite apart from these contending coteries we find E. J. Stagnelius (1793-1823), a mystical nature, who achieved perfection in almost every branch of poetry; the new romantic, J. L. Almqvist (1793-1866), who yet, in his novel *Det går an*, anticipated the realism of a later day; Böttiger; and many others. Epoch-making were the works of Runeberg (1804-77), notably *Fänrik Ståls Sägner*, undoubtedly the finest poet of the younger generation. In the 'forties appeared a group of romance writers reminiscent of Jane Austen, foremost among whom were two ladies, Frederika Bremer and Emilie Flygare-Carlén, whilst the historical romance was successfully cultivated by Starbäck and Crusenstolpe, though by far the best work in this department is Topelius's *Fäلتskärens Berättelser*, still the most popu-

lar of all Swedish story-books. In the 'fifties we meet with a group of writers who founded the poetic society 'N.S.'—Nyblom, Snoilsky, Björck, Wirsén, Wickner, and Bäckström, all of them neo-romanticists. Wirsén was the leading critic of the party, and Snoilsky incomparably its finest poet—indeed, his patriotic cycle of poems, *Svenska Bilder*, is one of the masterpieces of the literature. The realistic school, which arose almost simultaneously, owed much of its impetus to the Danish critic Georg Brandes, and is remarkable for its thorough-going, not to say unscrupulous, radicalism and its propensity to pornographic detail. August Strindberg, the shining light of the Swedish realists, has outraged every convention; but latterly he has taken a mystical turn, and his more recent works strikingly resemble those of Huysmans. Other notable realists are Fru Leffler-Edgren, Gustaf Geijerstam, and Ola Hansson. The banner of idealism was, however, speedily unfurled again by Victor Rydberg, whose *Singoalla* would alone suffice to immortalize his name. All his writings are eloquent protests against the extravagances of the ultra-realists. Two independent writers of great ability are Von Heidenstam and Levertin, both remarkable for the gorgeous beauty and vividness of their style. Heidenstam has lately restored the historical novel to favour by his brilliant cycle of tales *Karolinerna*, whose hero is Charles XII.; while Levertin is equally famous as a novelist, a poet, and a critic. Quite recently a writer of the first rank has emerged in Selma Lagerlöf, who in such works as *Antekrists Mirakler* and *Legender och Fortäringar* has invented an entirely new genre of an idealistic-religious tendency. In fact, Swedish literature abounds with rising talent—Lundegård, Henning, Lundqvist, Schröder, Hallström, Elkan, Wickström, D. Fjällström, and Fröding. The scientific and philosophical literature of Sweden is also considerable, and includes such names as Höijer, Boström, Ribbing, and Nyblaus among the philosophers; Geijer, Fryxell, Carlson, Malmström, Odhner, E. Tegnér, Alin, and Hildebrand among the historians; geographers, such as Nordenskjöld; chemists, such as Berzelius; botanists, such as Linnæus, Agardh, and Fries; philologists, such as Rydqvist and Söderwall. See Horn's *Hist. of Scandinavian Literature* (1834); Hammarskjöld's *Svenska Vitterheten* (1833); Linstrom's *Svenska Poesiens Historia* (1839); Dietrichsen's *Indledning i studiet af Sveriges Literatur* (1862); Wieselgren's

Sveriges Sköna Literatur (1843-49); Malmström's *Grunddragen af svenska Vitterhetens Historia* 1866-8); Ljunggren's *Svenska Vitterhetens Häfder efter Gustaf III.'s Död* (1873, etc.); Schück and Warburg's *Illustrerad Svensk Literatur-Historie* (1886, etc.); Ljunggren's *Svenska Dramat* (1864); Klemming's *Sveriges dramatiska Literatur* (1870); Schweitzer's *Geschichte der Skandinavischen Literatur* (1885-9).

Swedenborg, EMANUEL (1688-1772), Swedish sectary and physiologist, was born at Stockholm. Charles XII. appointed (1716) him assessor in the Royal College of Mines, and he rendered eminent service to that monarch as military engineer. He published, in 1734, his *Opera Philosophica et Mineralia*, in 3 vols.—the first being an attempt to furnish a philosophical explanation of the elementary world, the others treating of methods of mining and preparing iron, copper, and other ores. Later he turned his attention to physiology and anatomy with the special object of finding the soul, his works—*Œconomia Regni Animalis* (1740-1), *Regnum Animale* (1744-5), *De Cerebro*, and *Psychologia Rationalis*—dealing with man, not the brute creation, and containing many striking anticipations of later scientific development. His career, however, took a fresh trend in 1743-5. He claimed to have been called by the Lord to unfold the true, because interior, teachings of the divine Word on all Christian doctrine. His chief theological works are *Arcana Coelestia* (1749-56), an exposition of Genesis and Exodus, his largest and most valuable work; *De Cælo et Inferno* (1758); *Sapientia Angelica de Divino Amore et de Divina Sapientia* (1763); *Vera Christiana Religio* (1771), a complete statement of his doctrinal system. The spread of Swedenborgian doctrines was at first greatly due to a clergyman of the Church of England, the Rev. John Clowes, who translated many of the seer's books; and since then their adherents, known as the New Church signified by the New Jerusalem in the Revelation, have been divided into separatists and non-separatists. Of the former there are about 7,000 in 70 congregations throughout Great Britain. A society for publishing Swedenborg's works has existed since 1810. See R. L. Tafel's *Documents Concerning the Life and Character of Swedenborg* (1875-7), and *Lives by Wilkinson* (1849), Paxton Hood (1854), and W. White (ed. 1868); S. Warren's *Compendium of the Theological Writings of E. Swedenborg* (1885); E. Swift's *Manual of the Doctrines of the New Church*

(1885); and for his physiological works, C. G. Santesson, in *Nordisk Tidsskrift* (1904, No. 5).

Sweepstakes, a way of gambling by which a number of persons stake their money in a common pool, the whole of which falls to the winner. When a horse race is the subject of the stakes, each one who is concerned draws the name of a horse entered for the event, and either the holder of the winning horse takes the entire stakes, or those who hold the names of 'placed' horses receive a certain proportion.

Sweet Bay. See LAUREL.



Sweet Potato.

Sweetbread, the pancreas—i.e. a gland of the body which lies between the bottom of the stomach and the vertebrae of the loins. This organ, when taken from cattle and properly treated, forms a delicate article of food.

Sweet Brier. See ROSE.

Sweet Flag (*Acorus calamus*), a rushlike plant, natural order Araceæ, with sword-shaped leaves and two-edged, leaflike scapes, from one edge of which emerges a cylindrical spadix. It has pungent and aromatic properties, and its root-stock, the official *Calamus aromaticus*, is sparingly used as a stomachic, and in confectionery. It reaches from three to six feet, and is common in marshy ground.

Sweet Pea, the popular name of *Lathyrus odoratus*, an annual plant. It is of the easiest culture, but will repay in larger and better blooms for a little care in the preparation of the soil. A rich, deeply dug soil is desirable, and the seed may be sown in pots or boxes in a frame in January or February for planting out in April, or it may be sown in the open, from March to April, about two inches being allowed from seed to seed. Mr. Eckford has done more than any one to improve these flowers. It is always wise to red lead the seeds, in order to

protect them from birds and mice. Support the growing plants, if possible, with good hazel boughs, although birch is a good substitute; small twigs should be given as soon as the plants are well through the ground, as these will afford shelter and help the plants up on to the larger stakes. Before the hot weather sets in sweet peas should be given a thick mulch of long litter or grass or straw. The next best thing to mulching is to keep the Dutch hoe going continually.

Sweet Potato, the edible tuber of a South and Central American plant, *Batatas edulis*, belonging to the order Convolvulaceæ. It has a sweet, tender flesh, often faintly violet-scented. The red sweet potato is the variety most grown on the Continent.

Sweet-william, a biennial plant (*Dianthus barbatus*) of the easiest culture in any ordinary garden soil. The first variety with a distinct eye is referred to by Parkinson in 1629.

Swetchine, MADAME ANNE SOPHIE SOYMANOV (1782-1857), was born at Moscow; and though brought up in the Orthodox Greek Church, she joined the Roman Catholic Church in 1815, and shortly afterwards settled in Paris. In appearance unattractive, she nevertheless possessed a mingled spirituality and intellectual force which charmed a large circle of friends, and made her salon famous. Her *Letters* were published in 2 vols. (1861). See *Life* in French by Falloux (1860).

Swete, HENRY BARCLAY (1835), English theologian, was born at Bristol, and appointed professor of pastoral theology at King's College, London (1882-90), and regius professor of divinity at Cambridge (1890). He has written *Church Services and Service Books before the Reformation* (1896).

Swettenham, SIR FRANK ATHELSTANE, British administrator; was assistant resident at Selangor (1874-5); deputy commissioner with the Perak expedition (1876-7); assistant colonial secretary for native affairs (1876-81); British resident at Selangor (1882), at Perak (1889-95); resident-general, Malay States (1896); and governor and commander-in-chief Straits Settlements (1901-4). He is author of a *Malay-English Vocabulary* (1880), joint-author with Mr. H. Clifford of a *Malay-English Dictionary* (1894) and *Malay Sketches* (1895).

Sweyn, SVEIN, or SWEGN (d. 1014), king of Denmark, son of Harold Bluetooth, succeeded his father in 986. In the beginning of his reign he was defeated and imprisoned by the Swedes. In

994 he began his raids against England, and compelled Ethelred the Unready to pay him tribute. After recovering his lost Danish possessions from Sweden he formed an alliance with the Swedish king Olaf against Olaf Tryggvason, king of Norway, whom the allies defeated at the battle of Svoldr (1000), conquering at the same time S. Norway. The massacre of the Danes by Ethelred drew Sweyn once more to England, and by the end of 1013 he had conquered nearly the whole of that kingdom. He died at Gainsborough. As Swens he is mentioned by Shakespeare in *Macbeth*.

Swietenia. See MAHOGANY.

Swift, a general name applied to the members of the family Cypselidæ, which includes forms allied to the humming-birds, but presenting some superficial resemblance to the passerine swallows and martins (*Hirundinidæ*), with which they were formerly confused. Swifts differ from humming-birds in their broad flat skulls, the short curved bills, and the extremely wide gape, as well as in their sober coloration. They are distributed over the whole world, except the extreme north and south, but they are absent from New Zealand. There are about eighty species. Swifts are among the most aerial of birds, seldom alighting on the ground, and rarely perching save at night. The flight is exceedingly swift and powerful, and



Swifts.

during it the birds not only feed and mate, but also often collect the materials for the nest, which are glued together by the secretion of the salivary glands. In the genus *Collocalia* (see EDIBLE BIRDS' NESTS) this last is greatly in excess. The eggs usually number from two to four, or exceptionally only one. The note is a harsh scream, and the food consists of insects, whose indigestible portions are ejected as pellets. Swifts are divided into three subfamilies: (1) the Cypselinæ, including the true swifts, of which the common swift (*Cypselus apus*) is an example; (2)

Chaturinæ, including the genus Collocalia; and (3) Macropterygineæ, the tree-swifts of the Indian region, with but one genus. The common swift is in summer widely distributed throughout the British area, as through Europe generally; it winters in Africa, does not reach the shores of Britain till the end of April, and usually leaves again at the end of August. The length of the body is about seven inches, and is about equalled by the length of the wing. The plumage is black, save for a grayish patch on the throat—a fact which enables one to distinguish the bird readily from the swallow. The larger Alpine swift (*Cypselus melba*) of Central and S. Europe is a rare visitor to the British shores. There are numerous other species of this genus, both in the Old and the New World. Of the other subfamilies, special mention may be made of *Chaturia pelagica*, the so-called chimney swallow of N. America, which, like the common swift in Britain, is ceasing to nest in hollow trees, and is gradually acquiring the habit of breeding in chimneys. In the tree-swifts (*Macropteryx*) the single egg is laid in a small nest glued to the side of a branch.

Swift, JONATHAN (1667–1745), Irish satirist, was born in Dublin. In 1689 he became confidential secretary to Sir William Temple at Moor Park, Surrey. He took orders (1694), and was presented to the living of Kilroot, near Belfast, but about two years afterwards he returned to Temple. As chaplain to the deputy, Lord Berkeley, Swift returned to Ireland, and was given the small living of Laracor and a prebend in St. Patrick's Cathedral, Dublin. In 1704 he published an anonymous volume containing *The Battle of the Books* and *The Tale of a Tub*. Meanwhile in England he had been the friend and associate of the Whigs Somers and Halifax, Addison and Steele. Swift was far more of a churchman than a politician, and the Whig attitude to his favourite scheme for the remission of the Irish first-fruits ultimately led to his transferring his allegiance to the Tory party, whose cause he pleaded in the *Examiner*, and in a series of powerful pamphlets. For this he was preferred to the deanery of St. Patrick's. In 1724 he wrote a series of anonymous pamphlets entitled *Drapier's Letters*, protesting furiously against what all Ireland considered the scandalous terms on which a patent was granted to an English merchant named Wood to institute a copper coinage in Ireland. This made him the idol of his countrymen. *Gulliver's Travels* was published in 1726. The illness of his well-loved Stella

recalled him to Ireland, and after her death (1728) he never left that country. His *Modest Proposal*, in which he sardonically proposed to alleviate the misery of the Irish people by utilizing their children as food, appeared in 1729. In 1736, while writing his *Legion Club*, his mind first showed symptoms of giving way, and after five years of almost unrelieved misery he died, and was buried in the cathedral of St. Patrick. Swift was a master of the art of satire. The grave irony with which, in professing to plead his opponents' cause, he pours ridicule upon it is as unmatched as the simplicity and the lack of ornament of the medium through which it is expressed. In virtue of so wide-reaching and philosophical a creation as the tale of *Gulliver's Travels*, we may class him as the greatest satirist of



Jonathan Swift.

modern times. Three women figure in the unhappy story of Swift's life. In early years he had a passing courtship with a Miss Waring ('Varina'). The real affection of his life was for Esther Johnson—the 'Stella' of his verse—whom he first met at Sir William Temple's. For her he wrote the *Journal to Stella*, descriptive of his life in London, but never intended for publication; and there is a strong probability that he was latterly privately married to her. A third woman, Esther Vanhomrigh ('Vanessa'), loved Swift, and received from him in return an ardent friendship easily mistaken for love. But when jealousy moved her to ask for an explanation of his relations with Stella, Swift was so enraged that he abruptly broke with her. Vanessa was so overcome that she died shortly after (1723). By her will she left

directions for the publishing of Swift's metrical version of their romance, which appeared as *Cadenus and Vanessa* in 1726. Sir W. Scott's edition of 1814 is still the complete of Swift's *Works*; reissued by G. Saintsbury (1891). Selections have been edited by Traill (1884–5), Lewin (1886), H. Morley (1889–90), and Craik (1892). See *Lives* by Craik (1882), Sir Leslie Stephen (1882), Moriarty (1893), and Churton Collins (1893).

Swiftsure, a British first-class battleship (11,800 tons), launched in 1903. The name, originally *Swiftsuer*—i.e. 'swift pursuer'—was introduced into the navy in 1573.

Swilly, LOUGH, Ireland, a fine inlet between Donegal and Londonderry. Length, about 30 m. It is well adapted for a harbour of refuge, and fortifications have been erected. The largest battleships can anchor in Buncrana Bay.

Swimming. The power of swimming, or sustaining and propelling the body in water, is a natural faculty with quadrupeds, but has to be acquired by man. It is practised by all races of the globe, but brought to the greatest perfection by those in tropical climates: thus the pearl-divers of the Persian Gulf, Ceylon, and the Eastern Archipelago, the 'diving boys' of Aden and kindred seaports, the islanders of the Pacific, and the seafaring and fishing population of tropical seaboard, appear to be almost amphibious. The specific gravity of the human body is slightly less than that of water, and provided the whole body is immersed and the chest inflated, a person will not sink. Every portion of the body obtruded above the water adds to the weight of the submerged part, and soon reverses the narrow margin of buoyancy. The arms and head are the portions which the struggling non-swimmer instinctively elevates, with the result that the trunk and legs, encumbered with the additional weight, drag him down.

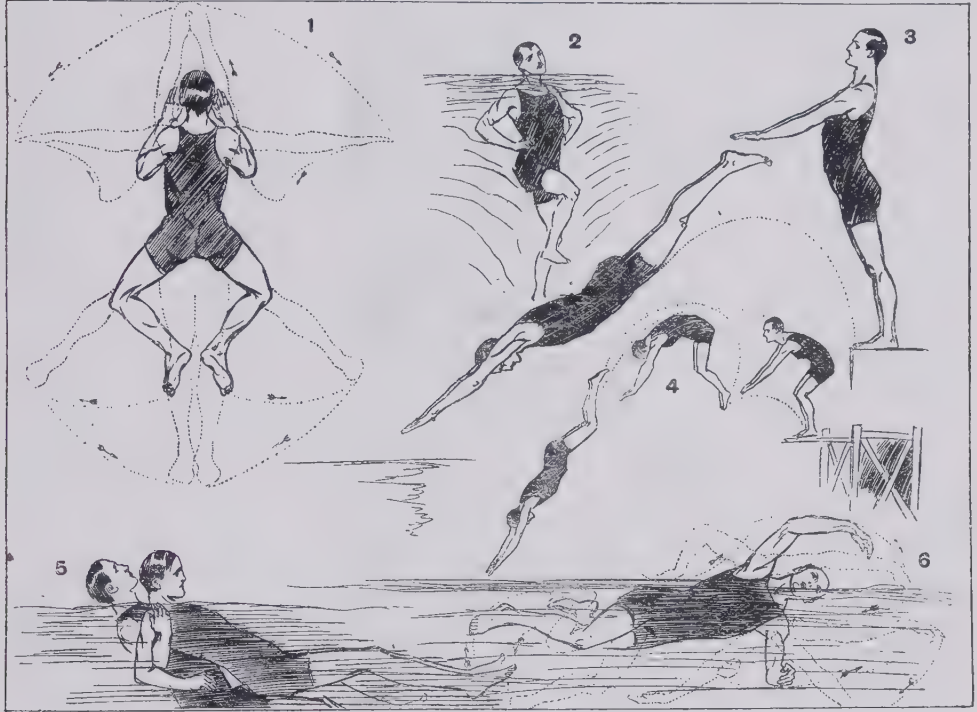
The best way to learn swimming is under an instructor, who, with the aid of a pole and a line at the end of it attached to a band round the learner's chest, keeps his pupil in the proper position, regulates to a nicety the exact amount of support requisite, and teaches the proper method of making the strokes. Such artificial aids as cork belts or bladders should never be used for learning; for although they prevent the body from sinking, they also prevent it from being properly submerged.

There are several methods or styles of swimming, the four commonest being the breast stroke,

the side stroke, the overhand stroke, and swimming on the back. The beginner need learn only the breast stroke, which is the natural one, and after he has mastered that he can teach himself the others. The action in the breast stroke is very similar to that of a frog swimming. The body is horizontal, the chest breasts the water, the chin is just clear of its surface, the arms are submerged about three, and the legs about eight, inches. The latter are the principal propelling power, and their action is circular and sideways to the body,

with the shoulders, when recovery to the starting-point is made. The movement of arms and legs should be slow, deliberate, and in unison. In the side stroke the swimmer progresses on his side, and, the resistance to the water being less, is able to attain a greater speed. In the overhand stroke one arm is carried over the head and out of the water in reaching for the fresh stroke, and this method is adopted by racing swimmers. Swimming on the back is the reverse of the breast stroke, except that the arms are moved like oars in rowing.

long-distance swimmer of recent years. He has made five attempts to swim the English Channel, and has had several imitators, including Madam Isacescú, who swam nearly 20 miles in 10 hours. In fresh water Miss Agnes Beckwith, in 1878, swam with the tide in the Thames 20 miles in 6 hours 25 min. The world's record for 100 yards is 58 secs., made by R. Cavill in Australia and by De Halmay in Hungary. The fastest swimmer of modern times was the youth B. B. Kieran of Australia, who died in 1905. In his brief career he made nearly a score of



The Movements of Swimming.

1. Breast stroke, seen from above. 2. Treading water. 3. The plunge. 4. The high dive. 5. Life saving—a good hold. 6. Overhand side stroke.

achieved by drawing the heels up, with the knees moving outwards, and then kicking out wide to either side, and slowly completing a circle until the original starting posture is gained, with the legs extended and the heels together. The arms should be bent and flexed in starting, the elbows within six inches of the sides, and the hands, thumbs together and palms downwards, under the chin. The stroke consists in shooting out the hands to the limit of the arms, and then, with a steady pull, sweeping the arms round until they are on a line

Swimming Records.—The most celebrated feat accomplished was that of Captain Matthew Webb, who, in August 1875, swam from Dover to Calais in 21 hours 45 minutes, covering an estimated distance of 46 miles. An even greater exhibition of endurance, notwithstanding that it lacked the *éclat* of success, was that of Mr. Montague Holbein, when, in August 1902, he swam from Cape Grisnez to within three-quarters of a mile of Dover parade in 22 hours 21 minutes, traversing a distance assessed at 53 miles. Holbein has been the most noted

distinctive world's records, the distances being from 200 yards to 1 mile. His time for 1 mile was 23 min. 16½ secs. Other remarkable feats are J. Finney's swim of 113 yards 1 foot under water, and Miss Wallenda's remaining submerged for 4 min. 45½ sec. at London in 1898. The affairs of the swimming world are regulated by the Amateur Swimming Association, founded 1869, which promotes the interests of swimming generally, arranges championship contests, and pays attention to 'water polo.' See *A Bibliographical List*

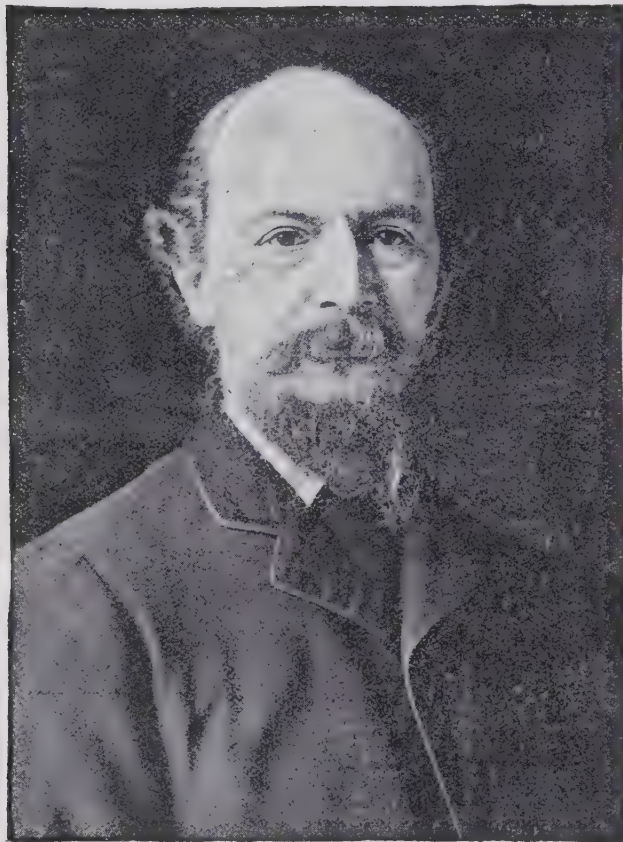
of *Works on Swimming*, by Ralph Thomas (1868); *The Swimming Instructor*, by W. Wilson (1883); *Swimming and Life-saving*, by W. D. Andrews (1889); *The Swimming Handbook*, by A. Sinclair (1890); *Swimming*, by C. W. Alcock (1894); *How to Swim*, by Dalton Davis (1899); *Swimming* (Badminton Library), by A. Sinclair and W. Henry (1900).

Swinburne, ALGERNON CHARLES (1837), English poet,

fore *Sunrise and Songs of Two Nations*. At Oxford he won the friendship of Dante Gabriel Rossetti, William Morris, and Edward Burne-Jones. To each of these, but above all to Rossetti, his debt would be difficult to appraise correctly. After Oxford he went to East Dene, near Bonchurch, in the Isle of Wight, the influence of which is as directly traceable in his earlier poetry as is that of his Northumbrian home. By this time he had writ-

Poems and Ballads (1878) that he left inner for outer London and took up residence on Putney Hill, where (with his intimate friend Theodore Watts-Dunton) he has since lived.

Mr. Swinburne published his first book, comprising the two dramas *The Queen Mother* and *Rosamund*, in 1860. The first of the two is almost a prelude to the great dramatic cycle of Mary Stuart, to which Mr. Swinburne gave the best years of his early and middle manhood. In 1865 he became one of the foremost poets of his time, by the publication of that superb lyrical drama in the Greek mould, *Atalanta in Calydon*. *Chastelard*, which also belongs to this year, should be considered as the first section of a trilogy on Mary of Scotland, its companion dramas being *Bothwell* (1874) and *Mary Stuart* (1881). But in 1866 *Poems and Ballads* not only created an intense interest, but aroused much vehement opprobrium. Apart from their great and enduring beauty, they read now as the work of a young and unbalanced mind aflame by the delight of life and the magic of beauty, and intoxicated by the joy of revolt—by the sheer pleasure, to put it colloquially, of 'kicking up a shindy.' *Songs before Sunrise* (1871) and *Erechtheus* (1876) convinced even the most hardly-won judges that Swinburne was the greatest master of metrical music since Shelley. With the exception of *Tristram of Lyonesse* (1882), it is doubtful whether his later works can be held to have the same poetic value as the earlier, as they certainly have not had a like poetic influence. In Swinburne we have a poetic dramatist of great power and beauty, and a rhapsodist of emotional life of unequalled enthusiasm and intensity. He is supremely the laureate of the sea. Of his work in prose the matter is generally admirable and always interesting, but in manner it is habitually efflorescent and redundant, and at its worst hysterical. His other books include *Songs of Two Nations* (1875); *Songs of the Springtides* (1880); *Studies in Song* (1880); *A Century of Roundels* (1882); *A Midsummer Holiday* (1884); *Marino Faliero* (1885); *Lochrine* (1887); *Poems and Ballads* (3rd series, 1889); *The Sisters* (1892); *Astrophel* (1894); *The Tale of Balen* (1896); *Rosamund, Queen of the Lombards* (1899); *A Channel Passage, and Other Poems* (1904); *Love's Cross Currents: a Year's Letters* (1905); *Atalanta in Calydon, and Selected Lyrical Poems*, in the Tauchnitz edition, edited, with biography, by William Sharp (1903). A collected edition of his works



Algernon Charles Swinburne.

(Photo by Elliott & Fry.)

was born in London. The boy was not in his teens before he began to compose lyrics and ballads. These were largely suggested or influenced by the scenery, traditions, and legendary romance of Northumberland and the Border lands. A little later he was strongly influenced by his mother, who had lived much in Florence and elsewhere in Italy. It is difficult not to find some association of this enthusiasm and influence in *Songs be-*

ten (though not then published) his first poetic drama, *Chastelard*, which, for all its crudity in certain respects, is unmistakably the work of genius. In 1865 he went to Italy, and visited Walter Savage Landor at Fiesole; to him he dedicated his first masterpiece, *Atalanta in Calydon* (1865). From this period Mr. Swinburne's home has been London, though it was not till after the publication of *Bothwell* (1874), *Erechtheus* (1876), and the second series of

was begun in 1904. See Woodberry's *Swinburne* (1905).

Swindling is cheating or defrauding by artifice for obtaining money, which may or may not be punishable as a crime, but which in most cases amounts to legal fraud, and would avoid a contract obtained by its means. To render swindling punishable it must come under either the head of larceny by a trick, or the obtaining of money or credit by false pretences—i.e. by a false representation as to an existing fact. See FRAUD and THEFT.

Swindon, munic. bor. and ry. junction, Wiltshire, England, 77 m. W. of London, and on Wilts and Berks canal. Public build-

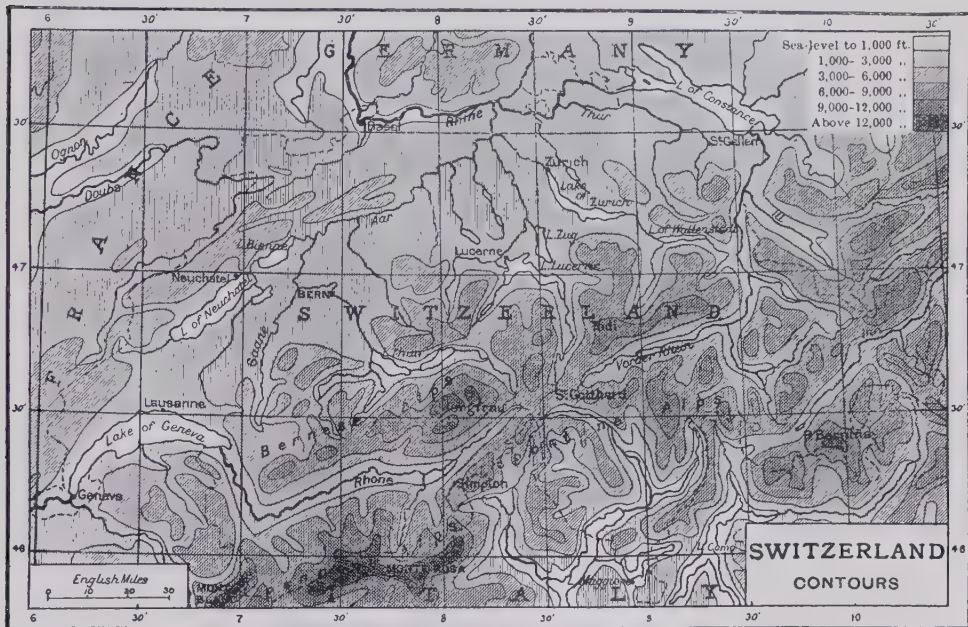
Swinton, suburban tnshp., Lancashire, England, 5 m. N.W. of Manchester. Pop. (1901) 18,508.

Swiss Guards, bodies of mercenaries who have formed the papal bodyguard for nearly two hundred years, and who served in the French army from 1616 as 'Les Gardes du Roi.' The latter distinguished themselves by their devotion to Louis XVI. at the time of the French revolution (1792).

Switch. (1.) A movable tapering piece or tongue of rail by which a train is directed from one line to another. (2.) An instrument for opening or closing an electric circuit. See ELECTRIC LIGHTING.

Swithin, SAINT (d. 862), bishop of Winchester, was in high favour with Egbert, king of the West Saxons, whose son Ethelwulf made him bishop of Winchester in 852. He became one of the chief counsellors of Ethelwulf. He was active as the builder of bridges and churches. His connection with English weather (July 15) is probably quite accidental.

Switzerland (Lat. *Helvetia*) has no natural frontiers, but is the creation of history. One canton (Schaffhausen) lies N. of the Rhine, though Constance and Mülhausen were ultimately lost to the confederation; another canton (Ticino) lies wholly S.



ings include town hall, market, corn exchange, and Railway Mechanics' Institution. Limestone is quarried. Here are locomotive and carriage works of the G.W.R., employing 12,000 persons. Pop. (1901) 45,006.

Swine. See PIG.

Swine Fever. See PIG—Diseases.

Swinemünde, tn., Prussia, prov. Pomerania, on isl. of Usedom, 35 m. by rail N.N.W. of Stettin; is strongly fortified, and is a watering-place. Pop. (1900) 10,251.

Swinton, tn., W. Riding, Yorkshire, 10 m. N.E. of Sheffield; has railway works, and manufactories of bottles, glass, pottery, and iron goods. Pop. (1901) 12,217.

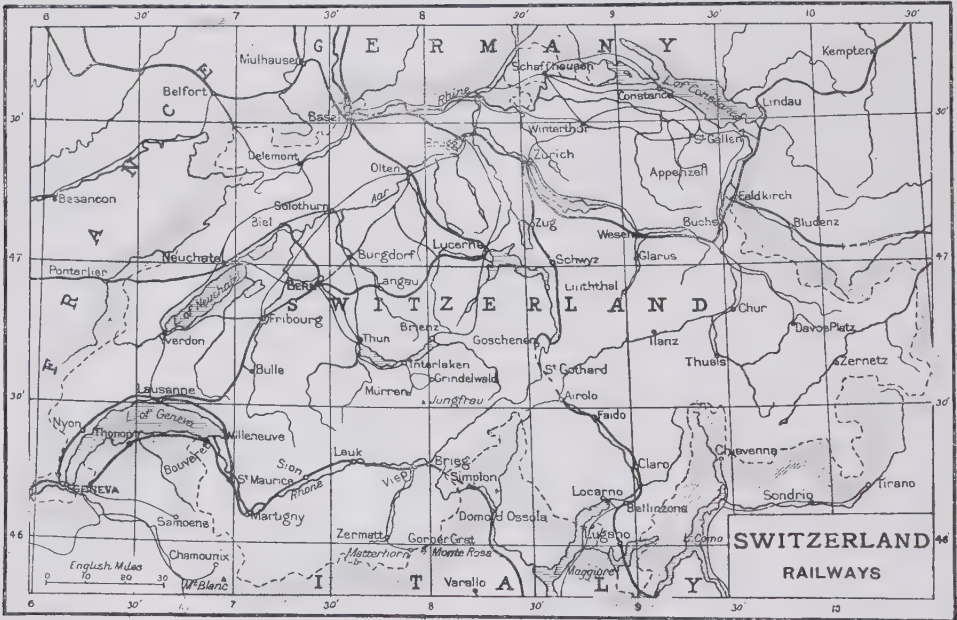
Switchback, a zigzag system of railway progression, in which the momentum secured by running swiftly down a declivity enables the cars to mount a steep ascent, sometimes, however, with the assistance of a stationary engine and cable rope. Other forms adopt the spiral system of ascent, where the principle of compensation ascents and descents enables the cars to overcome very steep gradients. The switchback system is applied to a popular method of amusement, in which cars are made to descend steep inclines, and the momentum thus acquired enables them to ascend to a point equal in height to the original starting-point.

of the Alps, though the similarly situated districts of Chiavenna and the Valtellina no longer form part of the Swiss confederation; while Geneva and Porrentruy on the W. are naturally French, though politically Swiss; and, on the other hand, the Engadine (or upper Inn valley), on the E., is wholly Swiss, though at least the Lower Engadine is historically part of the county of Tyrol. From a physical point of view Switzerland forms part of the 'highlands' of Europe, for it includes part of the W. Alps, and practically the whole of the Central Alps. The highest point wholly in Swiss territory is the summit of Monte Rosa (15,217 ft.), for Mont Blanc is non-Swiss.

But apart from Mont Blanc and its immediate neighbours, all the loftiest summits of the Alps are Swiss. The lowest point (646 ft.) in Switzerland is on the Lago Maggiore. Three of the greatest European rivers—the Rhone, flowing to the Mediterranean; the Rhine, flowing to the North Sea; and the Inn, which joins the Danube, and so drains into the Black Sea—rise, in the Swiss glaciers. With the exception of the Thur (which flows to the Rhine below Schaffhausen), the Aar, also an affluent of the Rhine, is the single really important Swiss river of which the entire course is within Swiss borders. In fact, putting aside

wholly Swiss is that of Neuchâtel (92 sq. m.), for Geneva (223 sq. m.) and Constance (208 sq. m.), as also Lago Maggiore (83 sq. m.), belong in part to other countries. Next come Lucerne (44½ sq. m.), Zürich (34 sq. m.), Lugano (19 sq. m., of which 12 are Italian), Thun (18 sq. m.), Bienne (16 sq. m.), Zug (15 sq. m.), Brienz (11½ sq. m.), and Morat (10½ sq. m.). The population in 1900 was 3,515,443, the three most populous cantons being Bern (590,914), Zürich (431,637), and Vaud (284,673); while the three least populous were Unterwalden (28,287), Zug (25,206), and Uri (19,732). In 1900 the three most populous towns were Zürich

1,200. For the mountain railways, see ALPS. It may be added that the Simplon tunnel was opened in 1906. To a large extent Switzerland is a pastoral country. The chief manufactured articles exported are cheese, condensed milk, chocolate, and other food products; silk and cotton goods, including embroidery; and clocks and watches. The total exports in 1905 amounted to £38,772,800, and the imports to £54,369,000. Politically Switzerland forms a confederation of twenty-two small states or cantons, the names of which, with the dates of their entry, are as follows:—Zürich (1351), Bern (1353), Lucerne (1332), Uri (1291),



the Rhine canton (the Grisons), the Aar basin includes the whole of Switzerland N. of the Alps. The total area of Switzerland is 15,994 sq. m. Of this, 11,461 sq. m. (71.7 per cent.) was classed as productive, 3,250 sq. m. being occupied by forests, and 127 sq. m. by vineyards. Of the unproductive 4,529 sq. m. (28.3 per cent.), 710 sq. m. are covered by glaciers, and 518 sq. m. by lakes. The three largest cantons—Grisons (2,773 sq. m.), Bern or Berne (2,657 sq. m.), and Valais (2,025 sq. m.)—occupy nearly half the territory of the confederation. The three smallest are Schaffhausen (113½ sq. m.), Geneva (107 sq. m.), and Zug (92 sq. m.). Of the lakes, the largest which is

(150,703), Basel or Bâle (109,161), and Geneva (104,796). Bern, the Swiss capital, had 64,227. As regards language, the figures for 1900 were: German-speaking, 2,319,105; French-speaking, 733,220; Italian-speaking, 222,247; and Romansch-speaking, 38,677. The religious statistics for 1900 were: Protestants, 1,916,157; Roman Catholics, 1,379,664; and Jews, 12,264. Education is very well organized, primary education being in the hands of the cantonal authorities. The seven Swiss universities (Basel, Zürich, Bern, Geneva, Lausanne, Fribourg, and Neuchâtel) are attended by nearly 5,000 students, and the Federal polytechnic school at Zürich by nearly

Schwyz (1291), Unterwalden (1291), Glarus (1352), Zug (1352), Fribourg (1481), Solcure (1481), Basel (1501), Schaffhausen (1501), Appenzell (1513), St. Gall (1803), Grisons (1803), Aargau (1803), Thurgau (1803), Ticino (1803), Vaud (1803), Valais (1815), Neuchâtel (1815), Geneva (1815). Unterwalden, Basel, and Appenzell are each divided into two half cantons. Each of these cantons has its own legislature, executive, and judiciary. The federal legislature is composed of two houses—one, the Council of States, has 44 members, two for each canton, great or small; the other, the National Council, has 167 members, elected for three years in the proportion of one

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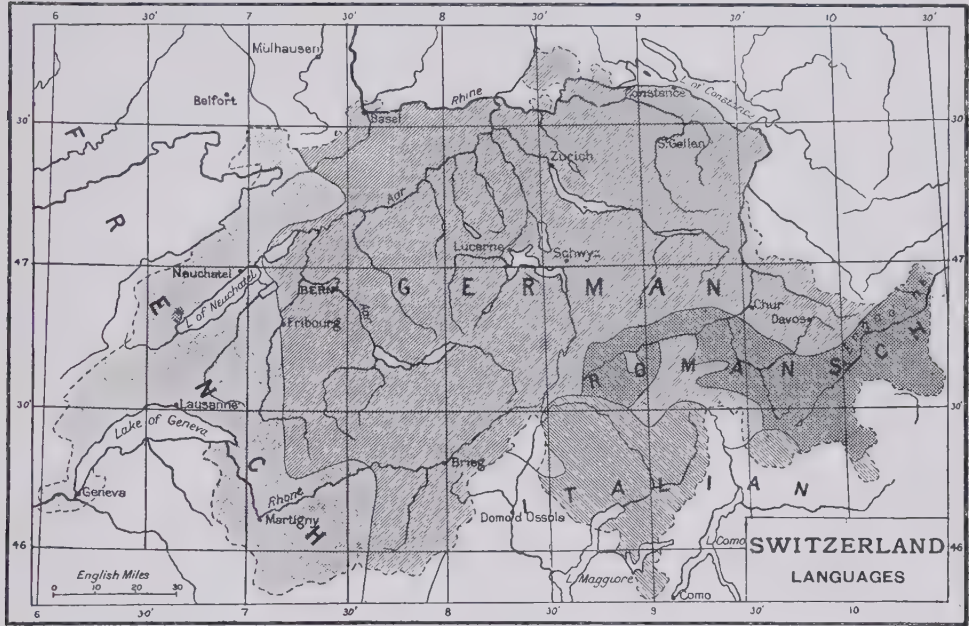
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to each 20,000 or fraction of over 10,000 inhabitants. The houses, sitting together, elect (for three years) the 7 members of the federal executive (Federal Council), including the president and vice-president. German, French, or Italian may be used in the federal legislature. Certain bills *must* (obligatory referendum), and others *may* (facultative referendum), if required by eight cantons or 30,000 citizens, be submitted to a popular vote. Proportional representation has been adopted in the cantons of Ticino, Neuchâtel, Geneva, Zug, Soleure, Fribourg, and Schwyz, and in the town of Bern. By the laws of the confederation no standing

information in his *Social Switzerland* (1897), which may be supplemented by A. Lecoq's *Inventaire des Institutions Economiques et Sociales de la Suisse à la fin du 19^{me} Siècle* (1900). See also *Die Industrielle u. Kommerzielle Schweiz beim Eintritt ins xx. Jahrhundert*.
History.—It was only in 1815 that the country now known as Switzerland came into existence as a distinct 'land,' while the name 'Switzerland' was not officially given to the Swiss confederation till 1803. The thirteen cantons which formed this confederation up to 1798 were all German-speaking, for it was only between 1798 and 1815 that the

alliance, which came to be known as the Everlasting League. This formed the nucleus of the Swiss confederation. But the Hapsburgs, even after losing the empire in 1292, and again in 1308, exercised great pressure on the members of the league. Hence in 1315 appeal was made to arms, and Leopold of Austria led a great army to crush Schwyz, the leader of the league; but he was defeated with great loss on Nov. 15, 1315, at Morgarten. Three weeks later the victors renewed in greater detail the league of 1291, and it was gradually joined by other districts—in 1332 by Lucerne, in 1351 by the free imperial city of Zürich, and in



army may be maintained. Military training is, however, compulsory on every citizen; and there are several forts and other military works along the frontiers. Children commence their military training at eight years old. It is estimated that in extreme emergency half a million perfectly-trained riflemen could take the field. The best general work is *La Suisse au 19^{me} Siècle* (3 vols, 1898-1900); but see also Hilty's *Politisches Jahrbuch der Schweizerischen Eidgenossenschaft* (annually since 1886). The best general description of Switzerland is that by H. A. Berlepsch, *Schweizerkunde, Land und Volk* (2nd ed. 1875). Mr. W. H. Dawson has collected much

French-speaking, Italian-speaking, and Romansch-speaking cantons were raised to that status from that of subjects or allies. Anciently the house of Hapsburg had gradually obtained great possessions in Swabia, as well as the county of the Zürichgau, when in 1273 its head, Rudolf, was elected to the empire, and soon after (1282) secured the duchy of Austria. Rudolf's power rapidly increased in Central Switzerland, and threatened to deprive of their freedom the small communities settled in the valleys round the Lake of Lucerne. In August 1291 the three lands (forest cantons) of Uri, Schwyz, and Unterwalden bound themselves together in a defensive

1352 by the Austrian districts of Zug (won definitely in 1364) and Glarus (won definitely at the battle of Näfels in 1388), and finally in 1353 by the free imperial city of Bern, which in 1339, at Laupen, had broken the power of the neighbouring Burgundian nobles. This progress naturally irritated the Hapsburgs, and in 1386 another Leopold made another attempt to crush it, but met with defeat and death at Sempach on July 9, 1386; so that in 1389 the Hapsburgs made a temporary peace, which, after being often prolonged, ended in 1474 in a full renunciation of all claims. The league now took the aggressive, protecting the men of Appenzell (1411) against

their lord the abbot of St. Gall, and making alliances with (1412) the town of St. Gall and (1416) with the sister confederation in Valais, or the upper valley of the Rhone. In 1415, after the excommunication of Frederick of Austria by the Council of Constance, the league made its first conquests—viz, the Hapsburg dominions in the Aargau, henceforth ruled as subjects; while in 1403 Uri took the lead in a first attempt (defeated in 1426) to wrest from the Milanese the Val Leventina and the Val d'Ossola, both s. of the Alps. Soon a civil war broke out (1436) among the members of the league with regard to the inheritance of the last count of Togenburg, Zürich allying itself with Austria and holding out against the rest, but being finally defeated in 1450, after the confederates had beaten at St. Jakob (1444), near Basel, a band of freelancers coming from France to aid the Austrians. In 1452 the league made its first treaty of alliance with France, while in 1460 Thurgau was taken from Sigismund of Austria.

Very soon another enemy appeared on the scene—viz, Charles the Bold, Duke of Burgundy, Bern being in the forefront against him and his ally Savoy. Several portions of Savoy were seized (1474-5) by Bern and her allies, who twice inflicted very severe defeats on Charles's army—at Grandson on March 2, 1476, and at Morat on June 22, 1476—while they aided in his final defeat at Nancy in January 1477. These battles established the military fame of the confederates, and caused their services to be sought for by France. Quarrels, however, arose as to the division of the Burgundian spoil, which were appeased by the mediation of the holy Niklaus von der Flüe. Five other members were now added to the confederation—in 1481 Fribourg and Soleure (satellites of Bern), in 1501 the free imperial cities of Basel and Schaffhausen, and in 1513 Appenzell, while various towns became allied with the league. In 1497-8 two of the three leagues of Rhetia (Grisons) became allies, and in 1499 the confederates helped them to beat the Austrians in the battle in the Calven gorge, after which the confederation became practically free from the empire, though not legally till 1648. Early in the 16th century the attempt to secure lands in the Milanese was renewed—in 1500 Bellinzona was taken by the three forest cantons, and in 1512 most of the rest of Tessin by the confederates, as well as Chiavenna and the Valtellina by the Rhetian leagues. But Swiss rule at Milan itself (1512) was finally crushed at the battle

of Marignano in 1515. In 1516 and 1521 close treaties of alliance were made with France, and a few years later the religious reformation secured a footing first in Zürich (1522-4) and then in Bern (1528). Hence the rising power of the confederation became paralyzed by internal dissensions as to these two matters. The peace of Kappel (1531) after the death of Zwingli at the battle there, the death in 1564 of Calvin (who had reformed and ruled rigorously the French-speaking town of Geneva), and the formation by St. Charles Borromeo of the Golden League (1586) mark various phases in the religious conflict, the Roman Catholic members having a majority in the Diet or meeting of envoys from the thirteen full members. The French alliance meanwhile dragged the confederation into various conflicts, and drained it of its men, who became mercenaries in the French army. The one bright spot in Swiss history at this period is the legal acknowledgment by the emperor (1648) that the confederation was entirely independent of the empire, the position of which was practically taken by France. Two disastrous civil-religious wars in 1656 and 1712, a great peasant revolt in 1656, the harsh rule of the subject lands, and the more and more strictly aristocratic rule at home are the chief events to be noted, till signs of a revival of national life became visible in the foundation (1762) of the Helvetic Society. The old political and social state of things finally came to an end in 1798, when the French (as protectors of liberty) overturned the old confederation, and established the Helvetic republic, made up of twenty-three cantons. But in 1803 Napoleon swept away this system, reviving the thirteen old cantons, and adding to them six others (St. Gall, Grisons, Aargau, Thurgau, Tessin, and Vaud); while the old Diet was supplemented by a central government, held in turn for a year by that of the six great cantons. But naturally with Napoleon's fall the older state of things came back, the Congress of Vienna adding (1815) yet three more cantons (Valais, Neuchâtel, and Geneva), neutralizing Switzerland, but reviving the old Diet, and providing a central government (shifting every two years) only in the shape of that of Zürich, Bern, or Lucerne. Little by little (especially after 1830) more liberal ideas became prevalent in divers cantons, which revised their constitutions in that sense, and aimed at amending the federal pact of 1815. The crisis came on occasion of the suppression (1840-3) of various monasteries in Aargau, which caused the seven Roman

Catholic cantons to form in 1843 a Sonderbund or separate league; and when at last, in May 1847, the Liberals got a majority of cantonal votes in the Diet, civil war was inevitable. The Sonderbund war lasted but three weeks (November 1847), and ended in the defeat of the Sonderbund. The result was the federal constitution of 1848, which set up a central federal government, a central federal legislature, no longer a Diet of envoys, and a central federal judicial tribunal. Various rights were secured to every citizen, and the Jesuits were excluded from the territory of the confederation, while Bern was recognized as the capital. This is the basis of the revised federal constitution of 1874, which introduced the facultative referendum, while in 1891 the initiative for a partial revision of the constitution was adopted. In 1857 the king of Prussia renounced his hereditary rights to the principality of Neuchâtel. Since that date the history of Switzerland is but of local interest, the advance of Liberal ideas causing repeated revisions of the cantonal constitutions. The Radicals have since 1848 been in possession of power in federal matters, though not all-powerful. The state purchase (1898) of the five great railway lines, and gradually increasing federal expenses as against decreasing revenues, form perhaps the most salient features of recent Swiss history.

Bibliography.—Of general histories, M'Crackan's *Rise of the Swiss Republic* (new ed. 1901) is the best in English, and J. Dierauer's *Geschichte d. Schweizerischen Eidgenossenschaft* (2 vols. 1887 and 1892) the best in German—it stops at 1516. Complete and detailed are Dändliker's *Geschichte d. Schweiz* (3 vols. ed. 1892-5) and Van Muyden's *Histoire de la Nation Suisse* (3 vols. 1896-1901). More popular in style (with many illustrations) is the large *History* by Lutz in German (1900) and Gobat in French (1904). For the origins of Swiss history, see Echsl's splendid work *Die Anfänge d. Schweiz. Eidgenossenschaft* (1891), A. Rilliet's *Les Origines de la Confédération Suisse* (1868), and W. Vischer's *Die Sage von der Befreiung der Waldstädte* (1867). On constitutional matters consult J. M. Vincent's *Government in Switzerland* (2nd ed. 1900); Blumer's *Handbuch d. Schweiz. Bundesstaatsrechtes* (3 vols. 1877-91), which is better than Bluntschli's work (2 vols. 1875); while Dubs's *Das öffentliche Recht d. Schweiz*, (2 vols. 1878) is very clear, and Orelli's *Das Staatsrecht d. Schweiz. Eidgenossenschaft* (1885) is an admirable summary.

Literature. — Swiss literature proper dates from the 16th century, and is written in many tongues. In that age its chief glories were Conrad Gesner, philologist and naturalist; *Ægidius Tschudi*, the founder of Swiss history and of the Tell legend; *Josias Simler* and *Ulrich Campell*, both historians and topographers; besides the chroniclers *Stumpf*, *Valerius Anshelm*, and *Cysat*; while *Nicholas Manuel* and *Johann V. Travers* represented drama and poetry in an early form, as well as (in the *Suisse Romande*) *Beza* the theologian and *Viret*. In the 17th century the most prominent names are those of the historians and topographers, *Stettler*, *Merian*, *Plantin*; while the brothers *Cysat* represented the natural sciences, and *Agrippa d'Aubigné* and *Diodati* the department of belles lettres. The great Swiss literary revival took place in the 18th century. *Bourguet* founded in 1732 the *Journal Helvétique* or *Mercur Suisse*, while *Ruchat* and *Crousaz* devoted themselves to different branches of literature; the 'Société Helvétique' came into existence in 1760. At Zürich the chief figures were *Bodmer* and *Breitinger*, who sought to free German literature from its ancient shackles; *Solomon Gessner*, the pastoral poet; *Lavater*, now best remembered by his writings on physiognomy; and *J. J. Scheuchzer*, great in the physical sciences and a member of the English Royal Society. *Bern* boasted of *Albert Haller*, poet and much else besides, and *Wyttenbach* the naturalist; while at *Basel* was the philosopher *Isaac Iselin*, as well as the mathematicians *Euler* and the *Bernoullis*. In the later 18th century the literary centre of Switzerland was *Geneva*, rendered illustrious by the *Genevise*, *Rousseau*, and the stranger *Voltaire*, and boasting also of the Alpine naturalists and explorers, *Saussure*, *Bourrit*, and the *De Lucs*, besides *Necker* and *Mallet du Pan*, both mainly publicists. *Madame de Staël* and *Benjamin Constant* were both of Swiss origin, but belong to European literature. In the early 19th century we have the philosophers *P. A. Stapfer*, *A. Vinet*, and *Ch. Secrétan*; *Bridel*, who popularized the works of others; *Pestalozzi* the educationist; the historians *J. von Müller*, *Zschokke*, *Vulliemin*, and *Kopp*; and *F. Keller*, the discoverer of the lake dwellings. In German-speaking Switzerland, *Jeremias Gotthelf* (*Bitzius*), the describer of peasant life, with the novelists and poets *Gottfried Keller* and *C. F. Meyer*, are particularly prominent. Other well-known men were or are *Amiet*, the moralizer; *J. R. von*

Wyss and *Juste Olivier*, poets; *Töpffer*, *Rambert*, and *Javelle*, describers of the Alps; the scientists *Agassiz* and *Desor*; the novelists *Cherbuliez*, 'T. Combe,' *E. Rod*; the literary critic *J. V. Widmann*; *Scartazzini*, the expounder of *Dante*; and many historians, such as *G. von Wyss*, *Dändliker*, *Echslí*, *Dierauer*, *Meyer v. Knonau*, *Daguet*, *Vaucher*, *J. Gremaud*, and *Motta*. In *Romansch literature* we have *Pallioppi* the philologist, and the poets *Caderas* and *Flugi*, but this revival is purely literary. For a general view of past Swiss literature, see the *Histoires* of *Dändliker* and *Van Muyden*, and for that of the 19th century, ch. iv. of vol. ii. of *La Suisse au 19me Siècle*. Details are given in *Bächtold's Geschichte* of German-Swiss literature (1892), in those of *Godet* (1895), and *Rossel* (1889-91), relating to French Switzerland, and in the work of *Rausch* (1870) as to *Romansch literature*.

Sword, a blade of metal, flat and sharp-edged, used both in striking and in thrusting, and set in a hilt. The earliest swords were made of bronze. Controversy once raged among archaeologists as to whether the beautiful leaf-shaped swords of bronze found occasionally in barrows in Scandinavia, and frequently (but not with interments) in the British area, were Roman or pre-Roman. For the former hypothesis *Mr. Thomas Wright* and *Mr. C. Roach Smith* contended; while the pre-Roman view has been ably maintained by *Lord Avebury*, *Sir Henry Rhind*, *Sir John Evans*, and *Dr. Joseph Anderson*. The fact that swords of bronze, identical with those found in England and Scotland, have been discovered in many places in Ireland where the Romans never set foot is sufficient evidence of their non-Roman origin, especially when coupled with the fact that at the time of the Roman invasion the British sword was of iron, large, and blunt at the point. That the so-called smallness of the 'grip' argues an Eastern origin is another fallacy dispelled by modern experts. What is now visible of the grip in a Bronze Age sword is only that portion which, when the sword was complete, was covered with plates of bone or horn, 'which (to quote *Evans*) also possibly projected beyond the sides.' These leaf-shaped swords range in length from sixteen inches to over thirty inches. A few specimens are known having large rounded pommels. Swords of bronze with portions of the cetacean bone handles still *in situ* have been found in Ireland, and in one or two specimens gold ornamenta-

tion can be traced. Double-edged swords of bronze, with gold-decorated hilts and scabbards, were found at *Mycenæ*. The bronze sword form was perpetuated into the late Celtic period in blades of iron, a large number of these having been found in Britain and in France and Belgium. In many cases there have been preserved the sheaths and chapes which belonged to the sword of the Bronze Age.

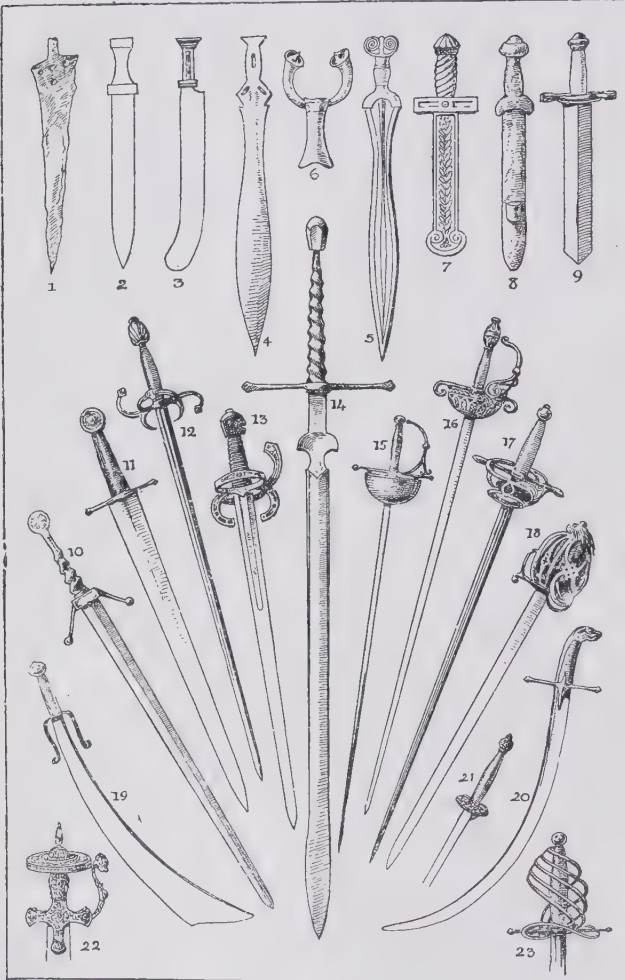
The Roman sword was straight, two-edged, and nearly of equal width throughout, occasionally measuring about three feet in length. The Greeks, previously to about 400 B.C., used a very short sword, slighter in make than the Roman. But the Britons outdid even the Romans in the size and weight of their swords. The viking sword was of iron, long, straight, broad, and weighty. The hilts are but rarely of bronze, and then decorated very richly with silver. Iron swords with bronze sheaths have been found in England; one having a very remarkably shaped handle of bronze was found at *Catterdale*, *Yorkshire*, another near *Cockermouth*, *Cumberland*, and a third at *Buckthorpe*, *Yorkshire*. The Swiss lake dwellings also have yielded a considerable number of these swords. The bronze sheath of a sword was found on *Mortonhall*, near the *Pentland Hills*. The type, therefore, is widely distributed, and their period has been computed to be from about 300 B.C. to 100 A.D.

The swords belonging to the middle ages, and to more recent times, may be grouped under the following heads: (1.) The scimitar, a highly-tempered curved blade, with the cutting edge on the convex side. It is one of the chief weapons used by Eastern nations. (2.) The sabre, the heavy sword of the dragoons, thick at the back, and meant for thrusting as well as for a cutting stroke. (3.) The rapier, in its recent form a light, highly-tempered thrusting weapon—the weapon of the duellist; it is now worn only in court ceremonies. (4.) The cutlass, a broad and straight-edged sword, about three feet in length, used by sailors when boarding an enemy's ship. (5.) Broadwords, now obsolete. The Highland claymore, which may be grouped here, measured in length of blade alone frequently over 3 ft. 6 in., the grip being 12 in., usually having a globular pommel, and the quillons of the guard ornamented in various ways. A two-handed sword, 8 ft. 5 in. in length, is preserved in the National Museum of Antiquities, *Edinburgh*. (6.) Basket-hilted swords have long tapering blades, often

slightly ribbed and fluted, with the famous name of Andrea Ferrara inscribed on the broadest portion, sometimes accompanied by the figure of a running fox. The blades are occasionally thirty-five inches in length, and the hilt-work displays richly designed open work. The fact of a blade

British cavalryman is a straight blade, 32 in. long, and weighing 2 lbs. It is adapted for cutting alone.

In Elizabethan times whiffles was the name applied to swords of wood, probably used for practice, and such swords are still carried by the whifflers who attend the



Swords.

1. Sword blade from Mycenae. 2. Persian. 3. Egyptian. 4, 5. Leaf-shaped swords, Bronze Age. 6. Hilt of a Bronze Age sword. 7. Greek. 8. Ancient Irish wooden sword. 9. Roman. 10. 13th century. 11. 14th to 15th century. 12. 16th century. 13. Sword of James IV. of Scotland. 14. Two-handed sword. 15-17. Basket-hilted rapiers, 17th century. 18. Claymore. 19, 20. Scimitars. 21. Hilt of rapier, 18th century. 22. Jewelled hilt of Indian sword. 23. Hilt of French sword, 17th century.

being inscribed Ferrara is not a proof that the sword dates from the time of that maker; the name was doubtless used to designate any well-tempered blade of this type for long afterwards.

The present pattern sabre of the

mayor of Norwich on the day of his being sworn into office. See Sir R. Burton's *Book of the Sword* (1884).

Sword-fish are pelagic bony fish which should not be confused with the elasmobranch saw-fish.

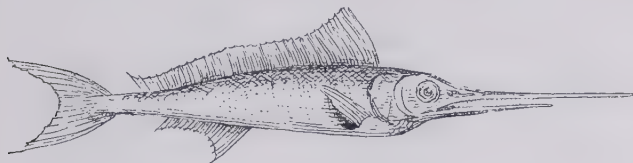
They constitute a special family (Xiphiidae), characterized by the fact that the upper jaw is produced into a long sword-like weapon, which is formed by the united maxillary and intermaxillary bones, and is rough on its under surface, owing to the presence of minute teeth. The lateral saw-like teeth of the saw-fish are, however, entirely absent. Sword-fish attain a length of from twelve to fifteen feet, and are exceedingly powerful and savage. They prey upon other large fish, such as cod and tunny, which are transfixed with the sword, and are also in the habit of attacking whales and other cetaceans, for what reason is not well known. They also attack boats and canoes, or even large vessels. In this case, though the sword can be driven through the solid wood, it cannot always be withdrawn, and is frequently broken off by the fish in its struggles to escape. In the South Sea Is. the fish are greatly dreaded. The body of the sword-fish is elongated and compressed, the eyes lateral, the mouth deeply cleft. The dorsal fin is either single or divided, and is frequently much elongated, so that when erected it projects above the water as the fish swims near the surface, and is then said to function as a sail, the fish quietly floating with the wind in search of prey. The common sword-fish of Europe is *Xiphius gladius*, which occurs in the Mediterranean and the Atlantic, and is occasionally taken in British waters. In the Indian and Pacific Oceans occur the species of *Histiophorus*, distinguished by the presence of two styliiform ventral fins. The Mediterranean species is used as food.

Sybaris, ancient Greek colony in South Italy, on W. side of Gulf of Tarentum, founded by emigrants from Achæa and Troezen about 720 B.C. The city became proverbial for its wealth and luxury. The people of the neighbouring Croton destroyed it thoroughly in 510 B.C., turning the river Crathis over the site.

Sybel, HEINRICH VON (1817-95), German historian, born at Düsseldorf; a pupil of Ranke, he became professor of history at Bonn (1841), Marburg (1846), Munich (1856), and again at Bonn (1861), which he held till 1875, when he was appointed director of the state archives at Berlin. He was a keen politician, occupying seats in succession in the Hessian Landtag, the Erfurt Parliament, the Prussian lower house, and the Constituent Assembly. This gave him that insight into political movements which renders his histories of such value. His principal works are *Geschichte des ersten Kreuzzugs* (1841-58; Eng.

trans. 1861); *Die Entstehung des deutschen Königstums* (1844); *Geschichte der Revolutionszeit von 1789 bis 1795* (1855-77); *Die Begründung des deutschen Reichs* (1889-94). His minor works have appeared as *Kleine Historische Schriften* (1863-80), also *Vorträge*

ting-boards for shoemakers, shopboards for butchers, and wooden type. Large wood is sought after for calico-printing rollers, and when quartered for those of washing-machines. It is superior to beech both as fuel and for charcoal.



Sword-fish.

und Abhandlungen (1897). He also initiated the issue of *Publikationen aus den preussischen Staatsarchiven und Politische Korrespondenz Friedrichs des Grossen*, helped to edit *Monumenta Germaniae Historica*, and founded and edited *Die Historische Zeitschrift*.

Sycamore, a British tree, *Acer pseudo-platanus*, with a straight, erect, smooth trunk, large, spread-

Sycophant, in ancient Greece, primarily an informer who gave notice of non-payment of dues owed to the state, in the hope of being rewarded by the state or bought off by his victims; hence the word has a secondary sense of 'blackmailer.' By the Attic orators it is used as a general term of abuse, the main idea being that of dishonest truckling to the people; hence its modern use, as a base flatterer.

Sycorax. See CALIBAN.

Sydenham, residential district, Surrey, England, $6\frac{1}{2}$ m. s. of London. Here is the Crystal Palace, a much-frequented place of amusement in ornamental grounds of over 200 ac. The building (removed here) is that in which the first International Exhibition (1851) was held in Hyde Park.

Sydenham, THOMAS (1624-89), English physician, born at Wynyford Eagle, Dorset. From the outbreak of the civil war till the surrender of Oxford, Sydenham served with the parliamentary forces. He commenced practice in London about 1660. Among his intimate friends he numbered Locke and Boyle. Sydenham introduced the cooling regimen of treating smallpox. In 1666 he published *Methodus Curandi Febres* (augmented as *Observationes Medicae*, 1676). His *Opera Omnia Medica* appeared 1685 (best ed. 1716). The Sydenham Society was named after him. See Johnson's *Life of Sydenham* (1742), and Picard's *Sydenham, sa Vie et ses Œuvres* (1889).

Sydney, **tn.**, cap. of New South Wales, Australia, is charmingly situated on the s. shore of Port Jackson, the entrance to which is upwards of a mile in breadth. On all sides the waters of the harbour encircle the city, and the quays and wharves are over 23 m. in extent, and permit the loading and discharging of vessels of the largest tonnage. The city is 4 m. from the Pacific. There are six islands in the harbour—Clark, a pleasure resort;

Shark, the quarantine station; Garden, the property of the imperial government, with hospital, foundries, shears, and naval stores; Goat, with powder magazine; Spectacle, for explosives; and Cockatoo, at the mouth of the Parramatta R., with a government dock. There are many bays, the principal being Watson's Bay, Chowder, Taylors, Athol Bight, Mossman's, Careening Cove, Neutral, Lavender, Berry's, Iron Cove, Snail's, Johnstone's, Woolloomooloo, Elizabeth, Rushcutter's, Double, Rose, Parseley's, and Hen and Chickens Bay. Darling Harbour wharf, at south-western end of the city, is also important. Many of the streets are narrow, tortuous, and without any pretensions to modern architecture. Of late years, however, some of the older portions of the city have been swept away, in some cases to make way for business establishments of modern design. The university is a fine sandstone building in the Gothic style. The City Bank and the Australian Joint Stock Bank are two of the handsomest buildings in Australia. Government House (Tudor style) overlooks Farm Cove, and is surrounded by the Domain and Botanic Gardens. St. Andrew's Cathedral, near the town hall, is a fine Gothic edifice. St. Mary's Cathedral (Roman Catholic) is a handsome building (1900). The town hall is of vast size, and possesses a very fine organ. The industries include coach factories, foundries, engineering works, and cloth mills. Queen Victoria Markets are a special feature of interest. Sydney has excellent parks and gardens—Hyde Park (40 acres), the Domain (138 acres), Botanical Gardens (38 acres), and Prince Alfred, Belmore, Callan, Moore, and Wentworth Parks. Pop. of city proper (1901) 111,801; including suburbs, 488,382.

Sydney, seapt. and mining tn., isl. of Cape Breton, former cap. of the colony, on a deep bay on N.E., 18 m. N.N.W. of Louisburg; has iron furnaces, and ships coal, and is the terminus of the Intercolonial Railway. Pop. (1901) 9,909. On the opposite (w.) side of the bay is North Sydney; pop. (1901) 4,646. And N. of N. Sydney, at the mouth of the bay, is Sydney Mines. Pop. (1901) 3,191.

Sydney, ALGERNON. See SIDNEY, ALGERNON.

Syene, ancient name for Assuan, Egypt.

Syenite, a granitoid, crystalline, igneous rock, consisting of orthoclase felspar, with hornblende, augite, or mica. The name is derived from Syene in Egypt. Typical representatives of this group are of considerable



Sycamore.

1, Flower; 2, pistil; 3, fruit.

ing, symmetrical branches, and large, five-lobed leaves. In early spring the greenish flowers appear in long, drooping clusters, and are followed by winged seeds of a reddish-green colour. The timber is highly esteemed on the Continent by turners, cabinet-makers, carvers, and toymakers, the figured wood being used for violins. It is manufactured into bread-plates, butter-dishes, and moulds, and is also in demand for hobbins, reels, coach-panels, cut-

importance in Saxony, Norway, Sutherlandshire (Scotland), the W. Alps. The Norwegian augite syenites (known as Laurvikites) are used as ornamental building stones and for monumental purposes. The augite syenites of Tyrol are known as Monzonites. In Norway, Finland, Portugal, Canada, Arkansas, Brazil, Madagascar, S. India, and Greenland, nepheline syenites occur.

Sylhet, chief tn. of Sylhet dist., in the Surma valley, Assam, India, 50 m. s. of Shillong. Pop. (1901) about 15,000. The district has an area of 5,413 sq. m., and a population (1901) of 2,250,000.

Sylla. See **SULLA**.

Syllabus, **PAPAL**, of the En-

right of the church to control education, the issue of literature from the press, and the conclusions of the scientific. There has been some discussion among Roman Catholics as to whether the syllabus is to be considered as uttered *ex cathedra*, and to be regarded as *de fide*. See W. E. Gladstone's *Vatican Decrees in their Bearing on Civil Allegiance* (1874) and *Vaticanism* (1875).

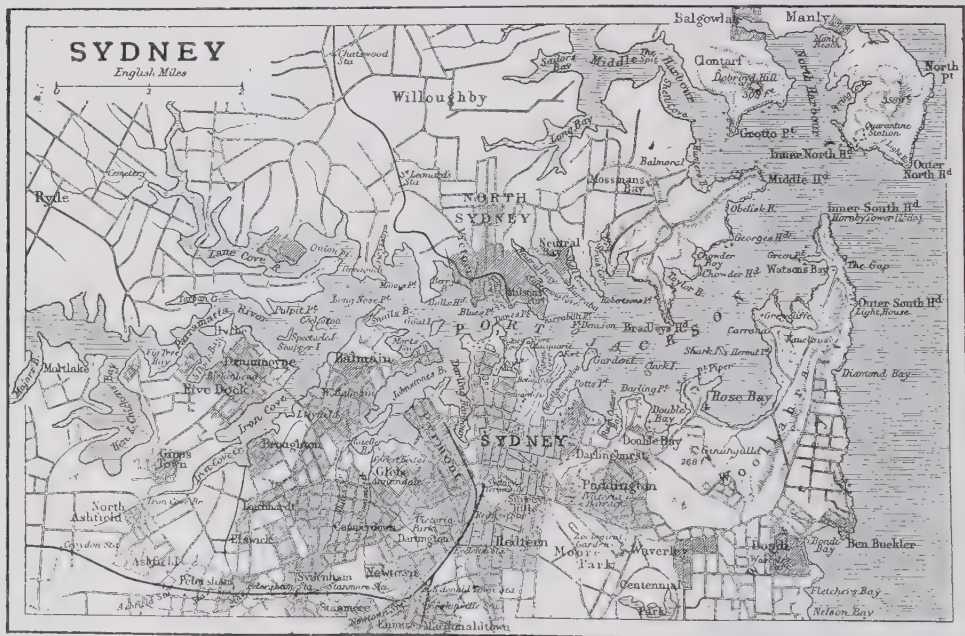
Syllogism, the type or general form, which Aristotle was the first to analyze, of those elementary processes of reasoning into a series of which more complex reasonings can be resolved. Each such unit-process or syllogism must consist of two premises, to-

of Paracelsus. ^o Sylphs are of both sexes, with many human characteristics, and are mortal, but do not possess a soul.

Sylt, largest isl. of N. Frisian group, belonging to Prussian prov. Schleswig-Holstein; visited in summer (May to September) for sea-bathing, the principal resort being Westerland, on w. coast. Area, 38 sq. m. Pop. 3,000.

Sylva, **CARMEN**. See **ELIZABETH** (Queen of Roumania).

Sylvester I., bishop of Rome, 314-335, the principal event of whose pontificate was the Council of Nicæa (325), which defined the articles of the Christian faith, and also determined the order of the hierarchy in the various



Barbalemev Edit!

cyclical *Quanta Cura*, issued by Pope Pius IX. on Dec. 8, 1864, contains a list of eighty heresies and religious errors, and the corresponding truths as their antidote. It is divided into ten sections, which condemn (1) rationalism, pantheism, and naturalism; (2) free thought of any kind; (3) latitudinarianism; (4) secret societies, such as freemasonry, together with communism and socialism; (5) opposition to the rights of the church; (6) errors on the condition of society; (7) on ethics; (8) on the law of marriage; (9) errors as to the temporal power of the pope; (10) the errors of liberalism. The infallibility of the pope is assumed, as is also the inalienable

together with the conclusion which they prove. For, to prove a predicate of a subject, we must have some connecting notion or 'middle term' within which both are related: for example, we may argue that a man is responsible for his actions on the ground that he is a free agent. Here the premises are 'Free agents are responsible for their actions,' and 'Man is a free agent,' and the conclusion follows, 'Man is responsible,' etc. Free agency is our middle term for connecting man's action with responsibility.

Sylph, in old poetic mythology, an elemental spirit of the air, holding an intermediate place between material and immaterial beings, according to the system

provinces of the empire. The epistles and decretals attributed to Sylvester are now considered apocryphal.—**SYLVESTER II.**, pope 999-1003, whose original name was Gerbert, was born at Aurillac in Auvergne about 950; became the head of the abbey of Bobbio (970), and afterwards archbishop of Ravenna. He is said to have introduced Arabic numerals, and to have invented clocks.—**SYLVESTER III.**, antipope 1044, bishop of Sabina, was proclaimed pope in opposition to Benedict IX. He reigned only about three months.

Sylvester, **JAMES JOSEPH** (1814-97), English mathematician, was born in London. He was professor in University College, London (1837-41); Univer-



Views in Sydney, New South Wales.

1. Town Hall. 2. University. 3. General view of town. 4. General Post Office. 5. Government House. 6. Museum, etc., Hyde Park.
7. Colonial Secretary's Office. 8. St. Andrew's Cathedral. (Photos by G. W. Wilson and Co.)

sity of Virginia (1841-5); Woolwich (1855-70); Johns Hopkins University at Baltimore (1877-83); and at Oxford (1883-97).

Sylvester, JOSHUA (1563-1618), English translator, was born in Kent, and became known by his translations from the French of Du Bartas and others, and Prince Henry made him (c. 1606) a groom of his chamber. In 1613 he became secretary to the Merchant Adventurers. See *Du Bartas, his Divine Weekes and Works* (1598; 1641, with *Pos-thumi*); *Collected Works*, ed. A. B. Grosart (1878).

Sylviculture. See FORESTRY.

Sylvia, a family erected for the warblers, now frequently included with the thrushes in the Turdidae.

Sylvin, or **SYLVITE**, a naturally occurring form of potassium chloride, KCl, found at Stassfurt in Prussia, and forming one of the principal sources of potassium compounds. It crystallizes in cubes (h. = 2, sp. gr. 1.9), is brittle, soluble in water, and has a bitter saline taste.

Sylvius, AENEAS. See PIUS II. **Sylvius, or JACQUES DUBOIS** (1478-1555), French physician, born at Amiens; lectured till his death on medicine at the College Royal, Paris. His *Opera Medica* were published in 1630. See René Moreau's *Vita Sylvi* prefixed to the *Opera*.

Symbiosis, a term first employed by De Bary for the very intimate and mutually beneficial partnerships which often occur between organisms, especially between plants and animals, or between two kinds of plants. In commensalism the union is much less intimate. The historic case of symbiosis is that of the lichens, but quite as well defined is the partnership between radiolarians and the so-called 'yellow cells,' which are really symbiotic algae. Here the host gains starch from the algae, which in their turn receive carbon dioxide and nitrogenous waste products. Among plants one of the most interesting cases of symbiosis discovered in recent years is that of the bacteria which form nodules or tubercles on the roots of leguminous plants, and enable these to utilize the free nitrogen of the soil.

Symbolism. A symbol is a sign, and differs from a *type*, which is a prefigurement of something or some one to come afterwards; and from an *allegory*, which is a figurative description. The symbol is always an object, and suggests something higher than appears to the eye. The American-Indian totem is an example of the symbolic treatment of tribal and family life. The hieroglyphics of Egypt are a symbolic script. Symbolism is

the language of heraldry; but it has had its widest range in connection with religion. It is to be found in its rudest form in Africa and the islands of the Australian archipelago. Elaborate symbolic designs are carved on the monuments of Central America. The worship of the phallus has its special symbol in every village in India, and adorns the temples at Benares. The Aryan tribes settled in India employ a symbol of the sun (*svastika*), which also appears in the Christian catacombs. The cross in the form of the Greek letter *tau* (τ) was used by the Egyptians as a symbol of eternal life. It has been supposed that this was the form of cross on which the brazen serpent was hung, and that it was the 'mark' referred to in Ezek. 9:4-6. Symbolism plays a great part in the worship of the Old Testament and in the structure of the Jewish temple. The early Christians no doubt used symbolic designs on rings and seals, as the fish, the dove, the palm branch, the anchor, and were thus enabled to know one another without betraying themselves to their persecutors. From the 3rd to the 8th century the carvings and frescoes in the catacombs supply us with abundant examples of early Christian imagery. Christ is depicted as the Good Shepherd, and a unicorn stands for purity and strength, or from its solitary habits it is the symbol of monastic life. The Blessed Virgin has no symbol in these early monuments; nor is the crucifix to be found until the 5th century. Until the 11th century any representation of Christ on the cross was wholly symbolic, being always clothed, and probably robed and crowned as high priest and king. Later still the robe was removed, but the kingly crown remained. The present realistic form of the crucifix is of quite late date. The Holy Spirit was sometimes depicted in human form, from the 10th century till the 17th, when Urban VIII. forbade the practice, and the dove has since been used as the appropriate symbol. The First Person in the Trinity, often treated as a man by the later painters, has no symbol in any work of the early church.

Symbols. (1.) *Chemical symbols*, as a means of expressing briefly the facts of chemical composition and action, were introduced by Dalton. The atoms of each element were represented by a circle, with some distinguishing mark, such as a cross, dot, or letter, whilst compounds were denoted by a cluster of these circles representing the atoms present; thus hydrogen

was \odot ; carbon, \bullet ; sulphur dioxide, $\odot \oplus \odot$. These devices were soon superseded by a simpler method initiated by Berzelius, which has remained practically unchanged till to-day. According to this system the atoms of the elements are symbolized by the initial letter or letters of the English or Latin name, these being combined to make the formulæ for the compounds, and provided with suffixes to show the number of atoms present. Thus N represents 1 atom of nitrogen, Ag (argentum) 1 atom of silver, AgCl the composition of silver chloride, and $\text{Al}_2(\text{SO}_4)_3$ that of aluminium sulphate. (See ELEMENTS for a full list.) AgCl states not only that silver chloride contains silver and chlorine, but that they are united in the proportion of 107.9 parts by weight of silver to 35.45 parts of chlorine, and so on. Symbols for molecules also express the volume relations of the substances when in the state of gas, as, in accordance with Avogadro's hypothesis, equal volumes of gases contain equal numbers of molecules, whatever their kind. For example, if the relative weights are expressed in gram proportions, each gram molecule occupies 22.22 litres when at standard temperature and pressure: thus N_2 , HCl, NH_3 , if taken in grams—i.e. 28 grams of nitrogen, 36.45 grams of hydrogen chloride, and 17 grams of ammonia—all occupy 22.22 litres. To express chemical actions, symbols are combined into equations in which the symbols of the substances taken are written on the left-hand side and the symbols of the products on the right. Thus, $\text{Zn} + \text{H}_2\text{SO}_4 = \text{ZnSO}_4 + \text{H}_2$ represents the fact that on putting zinc with sulphuric acid they react in the proportion of 65.4 parts by weight of the former to 98 of the latter, yielding 161.4 parts of zinc sulphate and 2 parts by weight of hydrogen, and that for every 65.4 grams of zinc a volume of 22.22 litres of hydrogen is obtained. In any case it must be remembered that symbols may only be arranged to represent facts, and that compounds must not be expected to exist or actions to happen in accordance with the infinite number of arrangements into which chemical symbols may be manipulated.

(2.) *Arithmetical and Algebraic.* + plus, addition; positive, of direction, rotation, electricity, magnetism, etc., or of quantity in general; compressive, of stresses. +^{ve} positive, - minus, subtraction; negative of direction, rotation, electricity, magnetism, or of quantity in general; tensile of stresses. -^{ve} negative, = equality; $a = b$, a is equal to b . \equiv is

identically equal to. \times mult., multiplied by. \div div., divided by; a/b or $\frac{a}{b}$ means a divided by b .

\therefore therefore. \therefore because. \therefore is to. \therefore as. If $a:b::c:d$, or $a/b=c/d$, then $ad=bc$. $\sqrt{\quad}$ square root. $\sqrt[n]{\quad}$ cube root. $\sqrt[n]{a}$ (n^{th} root of a) $=\frac{1}{a^n}$. $a^{-n}=\frac{1}{a^n}$; $a^0=1$. ∞ varies

as; $\therefore y \propto \frac{1}{x}$ means 'therefore y varies inversely as x .'

In such a case $y=m/x$, where m is a constant. $\{\}\{\}\{\}$ brackets. \sim vinculum, denoting that the included quantities are to be taken together. $a > b$, a is greater than b . $a < b$, a is less than b . $a \neq b$, a is not equal to b . $a \gg b$, a is not greater than b . $a \ll b$, a is not less than b . $a \sim b$, the difference between a and b . $a \approx b$, a is similar to b . $a \simeq b$, a is equal and similar to b . $n!$ or $n!$ = (factorial n) $n(n-1)(n-2)\dots 1$. ${}^n P_r$, permutations of n things r at a time. ${}^n C_r$, combinations of n things r at a time. $\begin{vmatrix} a & b \\ c & d \end{vmatrix}$, eliminant or determinant $=(ad-bc)$. \square , square; as \square cm., square centimetres. c.c., cubic centimetres. cm., centimetres. mm., millimetres. gm., grammes. $2' 7'' \times 1' 4''$, of dimensions, means two feet seven inches by one foot four inches. ∞ , infinity; a quantity greater than any assignable quantity. 0, zero; a quantity less than any assignable positive quantity, however small. Σ , algebraic sum of—i.e. taking account of signs. log, logarithm. a, b, c , etc., letters at beginning of alphabet, usually denote constants. x, y, z , letters at end of alphabet, usually denote variables. $\%$, per cent.

(3.) *Geometrical.* $\triangle ABC$ or ABC , the angle ABC . \angle^{rt} , right angle; at \angle^{rts} , at right angles to. \perp , perpendicular to. \parallel , parallel. \nparallel , not parallel. \square^{m} , parallelogram. \square^{piped} , parallelepiped. \square^{rect} , or \square , rectangle. \triangle , triangle. \odot^{circ} , circle. \odot^{se} , semicircle. \square , quadrant. \cap , arc. \odot^{a} , parabola. \odot^{e} , ellipse. \sphericalangle , hyperbola. R.H., rectangular hyperbola. \square , square—as \square , square inches; \square' , square feet. l , l , length. A , A , area. V , volume. R , r , radius or radius vector. D , d , diameter. ρ , radius of curvature. $P(x, y)$, the coordinates of the point P are (x, y) .

(4.) *Trigonometrical.* $60^\circ 27' 13''$ means sixty degrees twenty-seven minutes and thirteen seconds. \sin , \cos , \tan , etc., abbreviations of the circular functions sine, cosine, tangent, etc. (See TRIGONOMETRY.) π , ratio of circumference of a circle to the

diameter, or the value of two right angles in radians or circular measure, equals 3.14159 approximately. It has been computed to 607 places of decimals. $\sin^{-1}x$, the inverse sine of x . This is an angle θ such that $\theta=\sin^{-1}x$ or $\sin \theta=x$ —i.e. the angle whose sine is x . Thus $\theta=\cos^{-1}\sqrt{1-x^2}$. The other circular functions may be treated similarly. If ABC denote the angles of a triangle, then the sides opposite each angle respectively are a, b, c . θ, ϕ, ψ , α, β , used to denote angles. λ , latitude. e , the base of the Napierian or hyperbolic logarithms.

(5.) *Calculus.* $f(x)$, $F(x)$, $\phi(x)$, etc., function of x . $f(xy)$, $F(xy)$, $\phi(xy)$, functions of x and y . $f^{-1}(x)$, inverse function of x .

$\frac{d}{dx}$, symbol of differentiation as regards x . D , symbol of differentiation. $\frac{d^n}{dx^n}$ or D^n , differentiate

n times. \dot{x} , Newton's fluxional notation for differentiation as regards the variable t , which represents time. If x be a displacement, this is a velocity. Similarly \ddot{x} is an acceleration. δ , increment or variation of, δx , the increment or small increase of x . $\frac{\partial}{\partial x}$, partial differentiation

—i.e. as if x were the only variable. \int , symbol of integration; also D^{-1} .

(6.) *Mechanical.* F.P.S., foot-pound-second system. C.G.S., centimetre-gramme-second system. g , the value of the acceleration due to gravity in foot-pound-second units—32.2 approximately in Britain, or 981 in C.G.S. gravitation units. lbs., pounds. ft. lbs., foot pounds (work). lb. feet, pound-feet (moments). V, v, u , velocity. a, f , acceleration. T, t , time. M, m , mass. F , force. T , tension. p , pressure—i.e. force per unit area. A, a , area. l, L , length. V , volume. W , weight (total). w , weight of unit mass. T or KE , kinetic energy. V , potential energy. ω , angular velocity (constant). ρ, σ, λ , volume, surface, line density. E , Young's modulus, or modulus of elasticity. N , modulus of rigidity. n , number of, as of revolutions, alternations. I , moment of inertia. BM , bending moment. $S.F.$, shearing force. TM , twisting moment. Q , quantity. c, k , coefficients (constants). h , height. HP or $H.P.$, horse power. IHP , BHP , EHP , indicated, brake, electric horse power. $S.W.G.$, standard wire gauge.

(7.) *Physical.* t° , temperature in degrees. J , Joule's equivalent in foot pounds, 780 (F.), 1,400 (C.). F° , degrees Fahrenheit. C° , de-

grees centigrade. B.T.U., Board of Trade units. B.Th.U., British thermal units.

(8.) *Magnetic.* N , north pole of a magnet. S , south pole of a magnet. m , magnetic strength of pole. l , distance between two poles. $M=ml$, magnetic moment. H , horizontal intensity of the earth's field. I , intensity of magnetization ($=m/a$). β , magnetic induction, $\beta=H+4\pi I$. μ , magnetic permeability, $\mu=\beta/H$. MMF or \mathcal{M} , magneto-motive force (1.257 ampere turns). Φ or \mathcal{H} or F , flux or flow of magnetic lines. \mathcal{R} , reluctance or magnetic resistance. Magnetic symbols are sometimes expressed as block letters to distinguish them from other symbols.

(9.) *Electrical.* C , continuous current; C_a , armature current; C_e , external current, and similarly; C , also amperes. $E.M.F.$, electro-motive force. $P.D.$, difference of potential. E , electro-motive force; E_a , p.d. at terminals; E_a , E.M.F. in armature, and similarly; E , also volts. I , alternating current (maximum). i , alternating current (effective). R , resistance; R_a , armature resistance; R_s , resistance of shunt, and similarly; R , also ohms. ρ , specific resistance. L , coefficient of induction. I , impedance. ω , ohm. Ω , megohm. K, k , capacity. $mfd.$, microfarad. Q, q , quantity of electricity. z , electro-chemical equivalent. B.T.U., Board of Trade units. B.Th.U., British thermal units. P_w , power in watts. W , work in Joules. G , galvanometer. s , shunt. AM or A , ammeter. VM or V , voltmeter. $T+$, $T-$, positive and negative terminals. $c.p.$, candle power. n , number of turns of wire. \sim alternations per second. $| | a$ cell. $| | | |$ battery of three cells in series—long thin stroke for $+$ and thin stroke for $-$ plate. $F.M.$, field magnet.

\oint dynamo, continuous current.

\otimes motor, continuous current.

\otimes alternator.

\otimes alternating motor.

$\sim\sim\sim$ non-inductive resistance.

$\sim\sim\sim$ inductive resistance.

$\sim\sim\sim$ alternating current transformer.

\star arc lamp.

\circ glow lamp.

\parallel or $\sim\sim\sim$ condenser.

Syme, JAMES (1799-1870), Scottish surgeon, was born in Edinburgh. He was a pupil of Robert Liston, and studied at Paris and in the German medical

schools. In 1829 he started a private hospital at Minto House, Edinburgh, and became professor of clinical surgery in Edinburgh University (1833). Among his works are *The Excision of Diseased Joints* (1831), *Principles of Surgery* (1832), *Diseases of the Rectum* (1838), *Observations in Clinical Surgery* (1861). See *Memorials of Syme* by R. Pater-son (1874).

Symington, WILLIAM (1763-1831), Scottish engineer, born at Leadhills, Lanarkshire. In 1786 his brother and he constructed a working model of a steam road-carriage. Symington devised the first steamboat (the *Charlotte Dundas*) suitable for use.

Symmachus, QUINTUS AURELIUS (c. 345-405 A.D.), ancient Roman statesman and orator, was a native of Gaul. He held the offices of proconsul of Africa, prefect of Rome (384 A.D.), and consul (391). He was an ardent advocate of the ancient pagan religion. Fragments of his works are extant. There is an edition by Seeck (1883).

Symmetry, in zoology. A primitive organism, floating freely in a uniform medium, would tend to display the symmetry of a sphere, for each part of the surface would have the same relation to the uniform environment, and therefore no one region would tend to develop more than another. Such a primitive type of symmetry is displayed, for example, by the protozoan *Volvox*, and by certain of the cells of higher organisms: ova, for example, are typically spherical. If we contrast with *Volvox* such a sedentary organism as a sea-anemone, it is obvious that the fixed base has here a different relation to the environment from the free disc, and has a correspondingly different structure. But if we consider the disc alone with its circle of tentacles, then we find that each portion of its margin has the same relation to the surrounding sea-water, and has the same structure. Therefore the disc could be divided into approximately equal halves along many lines of division. This is *radial symmetry*, and is characteristic of the Coelentera generally, as well as of Echinodermata. Radially symmetrical animals are frequently sedentary, and when they possess the power of locomotion, as in jelly-fish and star-fish, the direction of movement is not fixed—that is, there is no one region of the body which is always directed forwards. On the other hand, most swiftly moving organisms have a distinction between head and posterior portion. The head region is specially rich in nerve cells

and sense organs, and is typically directed forwards during locomotion. At the same time, there is a distinction between right and left halves of the body, which is symmetrical only about a median line. This is *bilateral symmetry*, and is the most frequent type among animals. Finally, in some modified forms, especially those which, though descended from rapidly moving ancestors, have become stationary or sluggish in their movements, bilateral symmetry may be altogether lost. The snail, for instance, is an *asymmetrical* animal.

Symmetry, in mathematics. In complicated mathematical equations or operations it is often possible to put the quantities dealt with in a symmetrical form. They are thus most easily treated, and errors may be detected by lack of symmetry. Other results may often then be written down by analogy.

Symonds, JOHN ADDINGTON (1840-93), English writer, was born at Bristol, and at Oxford came under the influence of Conington and Jowett. He won in 1862 a fellowship at Magdalen. Symptoms of consumption and a nervous breakdown sent him to Switzerland and Italy, and in 1878 he settled at Davos Platz. His critical studies are of high value. His principal works are *Vagabunduli Libellus* (1884); *Wine, Women, and Song: Medieval Songs in English Verse* (trans. 1884); *Studies of Greek Poets* (1873-6); *The Renaissance in Italy* (1875-86); *Life of Shelley* (1878); *Shakespeare's Predecessors* (1884); *Life of Sidney* (1886); *Life of Ben Jonson* (1886); *Autobiography of Benvenuto Cellini* (trans. 1887); *Essays, Speculative and Suggestive* (1890); *Life of Michael Angelo* (1892); *Walt Whitman* (1893). See *Life*, by H. F. Brown (1895).

Symons, GEORGE JAMES (1838-1900), English meteorologist, was born at Pimlico, London. In 1860 he obtained a post in the meteorological department of the Board of Trade, but in 1863 decided to devote his whole energies to British rainfall. In 1860 he had already published rainfall returns at 168 stations in England and Wales. For 1861 he extended the work so as to embrace the whole of the British Isles, and was able to obtain about 500 records. At his death over 3,500 observers contributed returns to his annual publication *British Rainfall*. In 1866 he commenced the *Meteorological Magazine*. He reported his meteorological observations taken at Camden Town, N. London, to the registrar-general from 1857 onwards. In 1878 he became a fellow of the Royal

Meteorological Society, and president in 1880 and 1900. He edited the reports of the conference appointed to consider lightning-rods. In 1883 he was chairman of the committee appointed by the Royal Society to investigate the eruption of Krakatau.

Symons, SIR WILLIAM PENN (1843-99), British major-general; was engaged in the operations in Kaffraria (1878) and in the Zulu war (1879), and served on the staff in the Burmese expedition (1885). On the outbreak of the Boer war (1899) he was appointed to the command of the troops in Natal, but fell mortally wounded at Dundee.

Sympathetic Inks, or SECRET INKS. See INKS.

Sympathetic Powder. See DIGBY, SIR KENELM.

Sympathetic System. See NERVOUS SYSTEM.

Sympathy, or FELLOW-FEELING, as commonly understood, is the emotional state, painful or pleasant, induced by the sight or thought of pain or pleasure in others. The essential fact is that suffering or pleasure be somehow suggested, and this may occur with fictitious persons or objects as readily as with real. Bain regards sympathy as of the nature of a fixed idea, a primitive emotional endowment, the basis of altruistic conduct, of social emotions generally. It is thus presupposed in society itself, and is the condition of ethical growth. On this psychological ground, egoism and altruism are ultimate, and not directly reconcilable; hence one of the primary problems of individualistic ethics, utilitarian or Kantian. Baldwin, Stout, and Sorely, however, suggest that sympathy is rather an 'ejection' of our feelings into the self-form of another, and thus egoism and altruism are reconciled, as it were, in a larger egoism. Adam Smith made sympathy the basis of his *Theory of the Moral Sentiments* (1759). In aesthetics, sympathy is extended to include the artist's or spectator's acceptance of form and colour as the expressed essence of beautiful things. From the evolution standpoint, sympathy is an evidence of human sociality, actual or potential. It is the emotion of social unity. See also EMOTIONS.

Symphony, in music, was the name originally given to purely instrumental parts such as introduction, interlude, etc., when associated with the performance of vocal works, but it is now used chiefly to designate the greatest of all forms of orchestral composition. Its form is analogous to that of the sonata, and as a branch of composition distinct from the overture and orchestral

suite, its first great exponent was Haydn, whose later and best symphonies show the influence of his pupil Mozart. In his treatment of the symphony the last-named was markedly in advance of his contemporaries; but the greatest of all composers in this form was Beethoven, whose symphonies reach a sublimity unparalleled in the domain of intellectual music. Amongst other eminent composers of symphonic works have been Spohr, Mendelssohn, Schubert, Schumann, Berlioz, Raff, Rubinstein, Brahms, Tschalkowsky, and Dvorák. The title 'symphonic poem' owes its origin to Liszt, and is applied to orchestral works which do not rigidly adhere to the classic symphonic form, and usually have their subject-matter in the nature of programme music.

Symphoricarpus, a genus of hardy North American shrubs, belonging to the Caprifoliaceæ. They bear racemes or spikes of small white or rosy flowers, followed by white or red fleshy drupes. *S. racemosus* is the common snowberry; *S. vulgaris*, the coral berry or Indian currant; and *S. occidentalis*, the wolf berry.

Symplegades. See ARGONAUTÆ.

Symposium, the ancient Greek term for the drinking-parties which were a feature of their social life. The word has been used both by Plato and Xenophon as a title of a work which describes a conversation of Socrates and others; hence its use to express a social discussion of philosophical and other topics.

Synagogue, the Jewish place of religious worship. There is no trace of synagogues among the Israelites prior to the Babylonian captivity, nor, in express terms, until a long time after. They appear to have been originally erected outside the towns, in the fields, usually near waters, for the sake of ablution; but they were soon introduced into the towns, and were generally on the most elevated spots. Each synagogue had a kind of altar or table, at which the volume of the law was read; and at the east end was an ark or chest, in which that volume was kept. The seats were so disposed that the faces of the people were turned towards this sacred repository and towards the elders, who alone sat with their backs to the ark. With some modifications, the ancient usages are still maintained in the modern synagogues. The women sit in a separate part or gallery, where a wooden lattice screens them from observation. The men keep their heads covered.

Syncline. The strata of the earth's crust generally lies in folds or undulations, and when

the dip is towards a common central line or plane, the strata is said to lie in a syncline. See ANTICLINE.

Syncope. See FAINTING, DEATH.

Syncretism, a tendency to reconcile and unite various systems of philosophy or religious opinions on the basis of tenets common to all—the converse of *eclecticism*. In church history the term is applied to a move-

frequent use to denote the agents appointed by municipalities to watch over their interest at law; also by the universities to administer their affairs. The term is still used in Cambridge.

Syndicate, an association of individuals formed for the purpose of promoting any special enterprise, undertaking, or speculation requiring large capital, or for obtaining a certain monopoly in the production or sale of any



Interior of the Great Synagogue in Duke's Place, London.

(Photo by Topical Press Agency.)

ment in the 17th century, promoted by Calixtus, which advocated the union of the various churches—Protestants and Roman Catholics, Lutherans and the Reformed or Calvinistic sects—and the reconciliation of both with the Tridentine doctrine.

Syndic, an advocate, or one who maintained another's cause before a judicial tribunal. In the middle ages the term was in

article of commerce. The word is also applied to a combination of financiers started to buy up stocks or commercial commodities with the object of obtaining control of the markets.

Synergism, the co-operation of human effort with divine grace in the salvation of the soul, the term being specifically used to describe a type of semi-Pelagianism in Germany in the 16th cen-

tury. Its chief supporters were Erasmus and Melancthon.

Synesius (c. 370-c. 414), bishop of Ptolemais in Cyrenaica, N. Africa, was born at Cyrene. He was the pupil and friend of Hypatia at Alexandria. He came upon the public stage by leading an embassy (c. 398) from his native province to the emperor at Constantinople, where he remained three years, and wrote *Concerning Providence* (*Peri Pronoias*). After his return he wrote on *Dreams*, *The Praise of Baldness*, *Self-discipline* (a supplement to *Peri Pronoias*), and several hymns, redolent of the spirit of neo-Platonism. Having become a Christian, he was called to the see of Ptolemais. As a bishop, however, he was never quite at ease. Some one hundred and fifty-six of his inimitable letters have been preserved. Some have attributed to him the writings of (pseudo-) Dionysius the Areopagite. See *Lives* by Volkmann in German (1869), and Gardner for S.P.C.K. (1886), and W. S. Crawford (1901) in English.

Synod. See COUNCILS, PRESBYTERIANISM.

Synovial Membrane, a thin, delicate membrane, secreting a thick viscid and glairy fluid like white of egg. Synovial membranes are arranged in the form of short, wide tubes around joints, as the linings of synovial bursae, and as sheaths for tendons.

Syntax, DR. See COMBE, WILLIAM.

Synthesis, the combination of separate elements or thoughts into a whole; also a process of reasoning from propositions already proved to the conclusion—the opposite of analysis. See ANALYSIS. In chemistry, in its most general sense, synthesis is the process of building up complex compounds from their elements or simpler compounds, but is sometimes restricted to the preparation by laboratory methods, and from unorganized material, of the compounds naturally formed in the life processes of animals and plants. That the latter was possible was first demonstrated in 1827 by Wöhler, who prepared urea by heating ammonium cyanate.

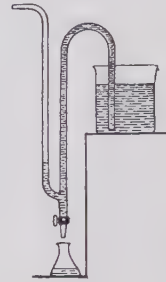
Syntonin, or ACID ALBUMIN, is an intermediate product of the gastric digestion of albuminates or proteids, which are eventually transformed into peptones. Syntonin may be produced outside the body by the prolonged action of dilute hydrochloric acid upon minced muscle. It is precipitated by sodium chloride and many other salts, as well as by neutralization with alkalis, but not by heat.

Syphax, king of the Massylians, a Numidian tribe. He first

appears at war with Carthage, in 213 B.C., but was completely defeated, and apparently made peace. Hasdrubal Gisco attached him to the side of Carthage by marrying him to his daughter Sophonisba. Soon afterwards he expelled Masinissa from the Massylian kingdom. Later he joined Hasdrubal in fighting against Scipio; but he was three times defeated (203 B.C.), and finally captured by the Romans. He adorned Scipio's triumph, and died in imprisonment.

Syphilis, a specific, highly contagious, but non-infectious disease, communicated by contact of the virus with a breach of surface or transmitted hereditarily. In the hereditary form of the disease a distinction is sometimes drawn between *congenital syphilis*, in which the ovum or spermatozoon is syphilitic, and *inherited syphilis*, in which the fetus acquires the disease through the mother contracting it during her pregnancy. The origin of syphilis is unknown, but many believe that the companions of Columbus on his first voyage to Hayti introduced the disease into Europe on their return in 1493. By the close of the 15th century it had spread in a severe and epidemic form through the greater part of the civilized world; and although no longer so violent as it then was, the disease has never been eradicated. While no human being is immune from the disease unless protected by a previous attack, it is remarkable that no animal, with the exception of the higher primates, has been shown to be susceptible to it. In the majority of cases the abrasion by which the virus enters the system is situated on the genital organs, but numerous instances are recorded in which scratches or sores on the lips, the hands, and elsewhere have admitted the poison. After the absorption of the syphilitic virus there ensues a period of incubation, which varies from fourteen to thirty or even forty days. At the end of that time a hard or indurated chancre appears at the seat of contagion. It is indolent, often painless, and throws off a thin, scanty, non-purulent discharge. To the touch a chancre feels like a nodule of cartilage. If kept clean, it tends to disappear spontaneously; but if irritated, it may break down and suppurate. About a week after the appearance of the chancre the nearest lymphatic glands become enlarged. Some six weeks after the development of the chancre an exanthematous rash appears, and is generally most marked on the chest. It consists of rosy red spots, which later become brownish. As this macular eruption

fades, papules often occur, and speedily assume a coppery hue. At the same time constitutional symptoms, such as loss of appetite, malaise, and sometimes desquamation of the cuticle, set in. The hair and nails may suffer, becoming dry and brittle, and even falling out. The mu-



Syphon.

cous membranes are also affected. Ulcers and mucous patches develop about the mouth, tonsils, and throat, while condylomata may appear about the genitals, especially in the absence of rigid cleanliness. Iritis and other eye symptoms, as well as muscular pains and articular swellings, may also occur. These and similar manifestations may continue for months, and in many cases the disease seems to end with them; but a considerable proportion of patients, especially those in whom the early stages have been neglected, develop tertiary symptoms, which are often of a grave and intractable nature. These may be severe eruptions, such as rupia; or gumata may form in the subcutaneous tissues, in muscle, bone, brain, or other internal viscera. Along with such symptoms there is often a characteristic cachexia. At a still later period nervous diseases, such as general paralysis and locomotor ataxia, may follow an attack of syphilis. Though in some cases syphilis runs a rapid, malignant, intractable, and fatal course, the disease is generally amenable to treatment, which, however, must be begun early and persisted in for eighteen months or two years. General measures are the maintenance of the general health, and the cautious but continued administration of mercury. Too much stress cannot be laid on the contagious nature of a syphilitic patient. His blood, secretions, and discharges may communicate the disease to those around him. Razors, pipes, tumblers, spoons, handkerchiefs, and clothes are contaminated by his use of them, and his kiss is more dangerous than a leper's. Syphilis contracted during pregnancy often

leads to miscarriage. Should the labour be at full time, the infant is generally puny, malformed, and the victim of specific affections, such as 'snuffles,' and of diverse diseases of the bones and skin.

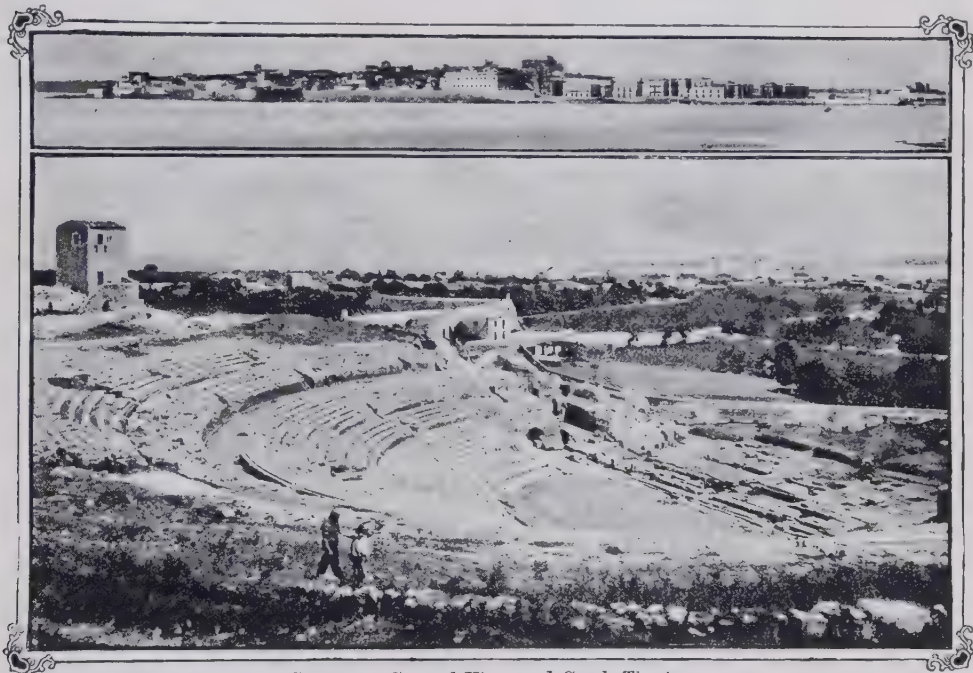
Syphon, or **SIPHON**, a bent tube with one limb longer than the other, by means of which a liquid can be drawn off to a lower level over the side of a vessel or other point higher than the upper surface of the liquid. When the tube is filled with liquid, the atmospheric pressure on the surface tends to force the liquid up the tube to an extent that is more or less opposed by the downward

limb, so that by temporarily crossing the lower end of the syphon the liquid can be sucked over without the risk of getting it into the mouth.

Syra, or **SYROS**, isl., Cyclades group, Greece, 10 m. s.w. of Tino; covers an area of 55 sq. m., and produces wine, oil, and fruit. It exports sponges, tobacco, and Naxos emery. The capital is Syra, or Hermupolis. Pop. 26,856.

Syracuse, the most important of the ancient Greek colonies in Sicily, was founded about 734 B.C. by emigrants from Corinth, and is on the E. coast. The original settlement was on a small island, Ortygia, at the N. of the Great

the N., and that of Neapolis on the S. The complete circuit of the walls at their greatest extent was 14 m. Syracuse herself founded the colonies of Acraë in 664 B.C., Casmenæ in 644 B.C., and Camarina in 599 B.C. Up to this time and down to 486 B.C. the government of the city was oligarchical; but in that year the people expelled the governing class, called Gamori. They appealed to Gelon, the tyrant of Gela, to restore them. He did so, but made himself master of the city, and removed to it half of the inhabitants of Gela, all those of Camarina, and others from Megara and Eubœa. Thus



Syracuse: General View, and Greek Theatre.

pressure of the column of liquid up to the bend. In the other limb the atmospheric pressure is also opposed by the pressure of the column of liquid; but if this is longer than the column on the other side, there will be a corresponding unbalanced downward pressure, and the water will flow in that direction, unless the height of the upper level to the bend is such that the pressure of the column of liquid is greater than the atmospheric pressure can support, when a vacuum forms at the bend instead. In order to start syphons conveniently, they are sometimes made with an additional tube joined near the end of the lower

Harbour, and later connected with the mainland by a bridge. On the N. side of the island, between it and the mainland, was a deep inlet, called the Lesser Harbour. Beyond it the mainland rises rapidly into the table-land of Achradina, from 200 ft. to 400 ft. above sea-level. The city soon spread from Ortygia to the level ground S. of Achradina, and by the 5th century it covered practically the whole of Achradina; both the island and Achradina were separately fortified. During the following century two new quarters were added on the triangular plateau of Epipolæ, which stretched W. of Achradina—viz. the suburb of Tyche on

he made Syracuse the first city in Sicily. In 480 B.C. he defeated a Carthaginian army at Himera. He was succeeded by his brother Hiero, who defeated the Etruscans at sea in 474 B.C., and he by Thrasybulus; but in 467 B.C. the citizens of Syracuse rose against him and expelled him. After some civil strife a democracy was established, and it overcame the Athenian expedition which besieged the city between 415 B.C. and 413 B.C.; but in 405 B.C. Dionysius made himself tyrant of the city. In his reign, which lasted until 367 B.C., there were wars with Carthage; but Dionysius extended the power of Syracuse over all E. Sicily and

much of S. Italy. He was succeeded by his son Dionysius II., who was expelled by Dion in 356 B.C.; but Dion was murdered in 354 B.C. Dionysius II. recovered his power in 346 B.C., but was driven out again in 344 B.C. by Timoleon, who freed the Syracusans from tyranny, destroyed the tyrant's great fortress in Ortygia, liberated other Sicilian towns, and decisively defeated the Carthaginians at the Crimissus in 339 B.C. But in 317 B.C. another tyrant, Agathocles, arose, who ruled until 289 B.C. Then the city was held by a succession of military adventurers, until 275 B.C., when Hiero gained supreme power. He ruled until 216 B.C.,

Athena are built into the walls of the cathedral; and the fountain of Arethusa still exists on the sea front. In Neapolis the Greek theatre remains in fairly perfect preservation; near it are the base of a colossal altar, built by King Hiero, and the Roman amphitheatre. At the extreme end of Epipolæ the ancient fortifications still remain to some extent; the subterranean galleries are in perfect condition. The local museum contains valuable antiquities. A remarkable feature of the place is the huge quarries in Achradina and Neapolis, which were used as prisons. There is also a vast extent of catacombs at the s. end of Achra-

by Samarkand and Bokhara on the s., and by Khiva and Lake Aral on the w. Area, 194,147 sq. m. Chief town, Tashkend, the capital of the general government of Turkestan. The Syr Daria (*daria* = 'river'), the principal artery of the province, divides it into the Kizil-kum desert (to the w.), and a composite region, partly belonging to the steppe-land of the Aral-Caspian depression—e.g. the Muyn-kum or Ak-kum and the Kara-kum—and partly to the Tian-Shan mountain system (to the e.). The Amu Daria, or Oxus, forms, for about 180 m., part of the s. boundary, and the Chu forms part of the N. boundary. Among the mineral riches are turquoise, silver, gypsum, porphyry, copper, lead, coal, and salt. The chief crops are wheat, barley, millet, and rice; then come rye and oats, cotton and melons, silk and grapes. Over 56 per cent. of the area is waste land, and 41 per cent. pasture land. The domestic industries include weaving, metal-working, shoe and harness making, tailoring, and forging. The chief industrial establishments are cotton-mills, tanneries, distilleries, and manufactories of matches, soap, and candles. The province was gradually conquered by the Russians between 1846 and 1867. Pop. (1897) 1,479,492, about one-half being Kirghiz, and one-seventh Sarts, with Kara-Kalpaks, Uzbeks, and Tajiks. (2.) Also JAXARTES, riv., Russian Central Asia, trib. of Lake Aral, rising in the Terskei Ala-tau range (s.e. of Issik-kul), at 14,530 ft. above sea-level, and flowing s.w. to Khojent, and thence n.w. to the Aral. Its length is 1,700 m. Down to its junction with the Kara Daria (near Namangan in Fergana) it has the name of Naryn.

Syria, a country of Asia, known to its original inhabitants as Aram, though this term, in a wider sense, included also Mesopotamia. The name Syria only differs from Assyria in that the latter has the definite article prefixed; it was first used by Herodotus (c. 450 B.C.). The boundaries of Syria at its fullest extent were the mountain ranges of Amanus and Taurus on the N., the river Euphrates on the E., the Arabian desert on the s.e., and the Mediterranean on the w. In a narrower sense, Syria was bounded on the s.w. and s. by the ranges of Mt. Libanus and Mt. Hermon, which divided it from Phœnicia and Palestine. That part of Syria which lay between the ranges of Libanus and Anti-Libanus was known as Coele-Syria. The chief river was called the Orontes (now Nahr-el-Asi). The inhabitants of Syria were



Syria.

and was allied with the Romans; but his grandson Hieronymus, who succeeded him, took the side of Carthage in the Second Punic war, and Syracuse was taken by the Romans after a two years' siege (214-212 B.C.), famous for the inventions in military engines of Archimedes. Towards the end of the 5th century A.D. the Goths conquered it; but in 535 A.D. it was restored by Belisarius to the Eastern empire. It was captured by the Saracens in 638 A.D., and then by the Normans some two centuries later. For its further history see SICILY.

Modern Syracuse is practically confined to the island of Ortygia. The columns of the temple of

dina; they were largely used for Christian burials. Chemicals and pottery are manufactured. The total trade amounts annually to between £400,000 and £500,000, three-fourths being for exports—olive oil, almonds, lemons, oranges, and asphalt. Pop. (1901) 31,807.

Syracuse, city, New York, U.S.A., co. seat of Onondaga co., at s. end of Onondaga lake. It manufactures clothing, foundry and machine-shop products, iron and steel, liquors, typewriter supplies, boots and shoes, agricultural implements, flour, and furniture. Pop. (1900) 108,374.

Syr Daria. (1.) Province, Russian Central Asia, bounded

all of the Semitic race. In the earliest times it contained a number of small kingdoms, of which that of Damascus was the most important. During the 8th century B.C. the Assyrian conquest took place; after the downfall of the Assyrian monarchy the country was subject successively to the Babylonian and Persian powers. The victories of Alexander the Great freed it from Persian rule; and in 310 B.C. Seleucus Nicator set up an independent kingdom of Syria (see SELEUCUS), though the districts of Coele-Syria and Palestine at first belonged to Egypt, and their possession was always disputed between the Syrian and Egyptian monarchies. In 64 B.C. Pompey made Syria a Roman province, and it remained part of the Roman empire until its conquest by the Saracens between 632 and 638 A.D. In 1516 it passed into the hands of the Turks. See further at PALESTINE and PHOENICIA.

Syriac Language and Literature. The Aramaic branch of the Semitic linguistic family, which comprises two distinct divisions—East Aramaic and West Aramaic, better known respectively as Chaldaic and Syriac—holds an intermediate position between the Assyrian of the cuneiform writings and the Canaanitish (Hebrew and Phoenician) of Palestine. Chaldaic, which replaced the non-Semitic Sumerian and Akkadian in Babylonia over two thousand years before the new era, ranged from the head of the Persian Gulf northwards to the district of Kir (2 Kings 16:9; Amos 9:7), which is now identified with the Yabur plain between the Tigris and the uplands of Elam. Here it was coterminous with Assyrian, which extended thence north to the present Kurdistan highlands; while the western division (Syriac proper) occupied most of Padan-Aram—i.e. Mesopotamia above Bagdad—and extended thence south-west to about the latitude of Damascus, capital of Syria from early historic and even prehistoric times. Despite this vast antiquity of both divisions, they differ from each other not more than does the Latin of Ennius from that of Cicero, such is the amazing tenacity of the Semitic group of languages. Chaldaic presents perhaps a more archaic phonetic system and a more exclusive Semitic vocabulary, while the structural differences are very slight. In other respects Syriac betrays far greater Hellenic influences in the adoption of numerous loan-words and phrases, and even some formative elements, besides many particles, such as *ἀλλά, γάρ, μὲν, etc.*, and

a normal shifting of the accent from the last syllable to the penultimate. Both use the same alphabet of twenty-two letters as the Hebrew, but the forms differ, Aramaic presenting several varieties, such as the graceful Palmyrene, the monumental Estrangelo, and the more cursive later Syriac, with a great poverty of vocalic marks, or else signs modified from the Greek vowels.

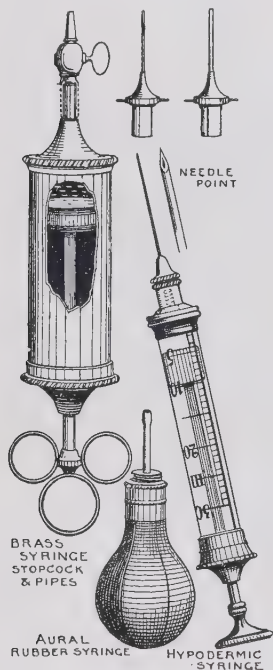
From the literary standpoint Aramaic forms three separate groups—(1) Chaldaic, which is essentially a Biblical literature, all its extant remains being either actual Scriptural texts (much of Daniel and Ezra) or paraphrases and explanations of the texts (the Targums referred to as Mid-rashes in 2 Chron. 13:22 and 24:27), and commentaries on the texts (the Talmud, of which the Mishna, or text, is in Hebrew, and the Gemara, or interpretations of all kinds, in Aramaic, some perhaps as old as the Targums, but none committed to writing till about 400–430 A.D.). This traditional Chaldaic literature was entirely superseded early in the new era by (2) Syriac, which may be called a Christian literature in a pre-eminent sense, all original documents dealing exclusively with Christian subjects. The earliest and most important is the Peshito ('pure' or 'simple'), a faithful Syriac version of the Bible made about 200 A.D., the whole of the Old Testament perhaps by Judaizing Christians from the Hebrew, and all the New Testament, except the 2nd and 3rd Epistles of John, the 2nd of Peter, Jude, and Revelation, from the Greek texts. Now was developed an extensive Syriac literature, which flourished from the 4th to the 10th century, and is associated with the names of Melito of Sardis, Bardosanes, Isaiah of Arzun, Jacob of Nisibis, and, above all, Ephraem the Syrian, besides Narsis of Edessa, Jacob of Serug, Xenaïas, Philoxenus, Thomas of Charcel, Jacob of Edessa, Moses Bar Cepha, Bar Hebraeus, and others mentioned and often most carelessly edited by Assemani in his *Bibliotheca Orientalis*. This literature consisted largely of early translations of the Greek fathers and of some classic authors, and it was on these Syriac translations, and not on the original texts, that most of the Arabic versions of the Greek works were made by Syrian writers, the Syriac literature thus merging, so to say, in the Arabic, by which it was replaced about the 10th century. After the Council of Ephesus (431 A.D.) the Syrian missionaries, who adhered to the heresy of Nestorius, carried their teachings and their language into the Kurdistan high-

lands, into Southern India (Malabar)—where the Nestorian ritual still survives—and into the heart of China, as attested by the bilingual (Syro-Chinese) inscription (781 A.D.), preserved in a Buddhist temple at Singan-fu, former capital of the Middle Kingdom. It was from these Nestorians that the Mongolians and Manchus acquired their knowledge of letters, and to this day write in a script based on the Syriac alphabet. Syriac also survives amongst the Catholic Maronites of the Lebanon, not as the vernacular, for all speak Arabic, but, by papal dispensation, as the liturgical language in which they are permitted to celebrate mass according to the Latin rite. There are or were three variants, as specified by Gregory Bar Hebraeus—the standard Aramaean of Edessa and Mesopotamia, that of Damascus and the Lebanon, and the corrupt variety of the Kurdistan and Lake Urmia districts—i.e. the Syro-Chaldaic, in which the two original Aramaic divisions are merged in one, and which is written in a locally modified form of the Estrangelo script. More distinct and more debased are the dialects of group (3), which may be described as pagan or semi-pagan literature. There are two marked varieties—Nabatean, which inclines more to Chaldaic, and is represented by a treatise on agriculture of unknown date with an Arabic version of the 10th century; and Mendeian or Sabeian, in which is written the post-Islamic *Book of Adam*, a mass of extravagant ravings recalling some of the wild legendary matter embodied in the Talmud. Mendeian, which is the most corrupt of all the Aramaic dialects, confuses the characteristic Semitic gutturals which are often elided, interchanges surds and sonants, and shows numerous contracted forms. With the Aramaic division is sometimes grouped the Samaritan, which, however, is much more akin to Hebrew—i.e. to the Canaanitic branch of the Semitic family. See J. Payne Smith's *Compendious Syriac Dictionary* (1903); Nestle's *Syriac Grammar* (1889); Maclean's *Grammar of the Dialects of Vernacular Syriac* (1898), and *Dictionary of the Dialects of Vernacular Syriac* (1901); W. Wright's *Arabic Grammar* (2nd ed. 1874), and *Short History of Syriac Literature* (1894); E. Renan's *Hist. des Langues Sémitiques* (3rd ed. 1863); Nestle's *Syriac Grammar* (1889); Fürst's *Lehrgebäude der Aramäischen Idome* (1835).

Syringa, a genus of hardy deciduous shrubs belonging to the order Oleaceae. They bear terminal panicles of flowers with

cylindrical corollas, often of much beauty. They are of very easy cultivation. Among the species is *S. vulgaris*, the common lilac.

Syringe, an instrument of the pump kind, consists of a cylindrical tube, with a perforated nozzle at one end, and a piston, to the rod of which a handle is attached. When the nozzle is immersed in water and the piston drawn to the upper end of the tube, the pressure of the atmosphere upon the surface of the water causes it to follow the piston, and so fill the syringe;



Common Forms of Syringe.

then by pushing the piston back towards the nozzle its contents may be ejected.

Syrinx, in ancient Greek legend, a nymph of Arcadia, whom Pan pursued. She took refuge in the river Ladon, and prayed to be changed into a reed, of which Pan made his pipe.

Syrin, JÖRG, German wood-carver of the 15th century. He is known as the Elder, to distinguish him from his son of the same name, who also obtained eminence as a carver. He executed the fine carvings on the stalls of Ulm cathedral (1469-74),

and the antiquarian society of that city possesses a singing-chair made by him (1458). He also executed the carving on the fountain in the market-place at Ulm.

Syros. See SYRA.

Syrtis, two deep and broad gulfs on the N. coast of Africa, famous in antiquity for their dangerous shallows and sunken rocks. The E. or Greater Syrtis is now called the Gulf of Sidra (E. of Tripoli), the W. or Smaller the Gulf of Cabes (E. of Tunis).

Syrup, a term applied to concentrated sugar solutions of a more or less viscous character, and by analogy to other liquids of a similar consistency. In pharmacy the name is given to watery solutions of drugs flavoured with sugar. (For golden syrup, see SUGAR.) A coloured glucose syrup, prepared from starch, is sometimes substituted for golden syrup.

Syrus. See PUBLILIUS SYRUS. **Syrus**, EPHRAEM. See EPHRAEM SYRUS.

Sysitia, at ancient Sparta, the common meal at which every citizen had to attend. Each man had to pay his own share of the expenses; those who could not do so lost the full privileges of citizenship. The company was divided into tables of fifteen persons, election to which was by ballot; one adverse vote excluded. The principal dish was black broth. A similar system obtained in Crete, where the meals were called *andrea*.

Syzygy, the position of the moon at conjunction or opposition. The line of the syzygies is the diameter of the lunar orbit connecting these points. At new and at full moon the sun, earth, and moon are approximately ranged along it.

Syzran, tn. and episc. see, Simbirsk gov., E. Russia, on r. bk. of Volga, 78 m. S. of Simbirsk. The cathedral dates from the 18th century. There are tanneries, iron and tallow foundries, distilleries, breweries, dye works, brick works, and manufactures of agricultural machinery. Pop. (1897) 33,046.

Szabadka, or MARIA-TERESIOPEL, tn., Bacs-Bodrog co., Hungary, 109 m. by rail S.E. of Budapest; is noted for the breeding of turkeys. Lake Palics, in the vicinity, is a popular summer resort. Pop. (1901) 82,122.

Szalay, LADISLAS (1813-64), Hungarian historian, was born at Budapest. His participation in the insurrection of 1848-9 compelled him to take refuge in Switzerland, where he wrote

History of Hungary (6 vols. 1850-60); *The Book of Statesmen* (1847-52), containing studies of Pitt, Fox, Mirabeau, and others; and a *Life of Count Nicholas Esterhazy* (1862-6). See memoir, in German, by Flegler (1866).

Szarvas, comm., co. Békés, Hungary, on l. bk. of Körös, 13 m. by rail S. of Mezötúr; is famed for its horse fairs. Pop. (1900) 25,773.

Szatmár-Németi, tn., co. Szatmár, Hungary, on r. bk. of Szamos, 38 m. by rail W.N.W. of Nagybánya; is a Roman Catholic bishopric, manufactures pottery, and has weaving. Pop. (1900) 26,881.

Sze-chuen, prov., W. China, lying N. of the Yang-tse-kiang. The eastern portion is among the richest and most productive in China; from the colour of its soil it has been named by Riechthofen the Red Basin. The capital, Ching-tu, is the centre of a vast scheme of irrigation formed about 250 B.C. Distribution of produce is facilitated by numerous navigable rivers. Rice, wheat, pulse, tobacco, Indian corn, and sugar are the chief crops. Opium, silk, white wax, wood oil, safflower, rhubarb, and musk are the principal exports. Iron and coal are widely distributed; salt wells in some places are bored to a depth of over 2,000 ft. Gold washings in the W. are numerous. Except in cotton, the province is self-sufficing. Access to it is only obtained up the Yang-tse-kiang rapids or through the Min Mts. by a road cut from Shen-si (on the N.). The Lolo people are almost entirely independent, and the Män-nya-ka, Solos, and others are little interfered with. Area, 218,500 sq. m. Pop. (1902) 68,724,800.

Szegedin, tn., cap. of co. Csongrád, Hungary, at the influx of the Maros into the Theiss, 74 m. by rail S.E. of Budapest. Since the disastrous floods of 1879, when 2,000 people lost their lives, the rebuilt town has been protected by a circular dam. Szegedin manufactures soap and cloth and builds ships. Pop. (1900) 102,991.

Szentes, tn., co. Csongrád, Hungary, on l. bk. of branch of Theiss, 30 m. N.E. of Szegedin. Pop. (1900) 31,308.

Szolnok, tn., co. Szolnok, Hungary, on r. bk. of Theiss, 58 m. E.S.E. of Budapest; manufactures linen thread and machinery. It was the scene of a victory by the Hungarians over the Austrians on March 5, 1849. Pop. (1900) 25,379.

T

T is the voiceless point stop; the breath is stopped by the point of the tongue. The tongue may occupy a whole series of positions—e.g. interdental (French), post-dental (English), or still higher up (Semitic *t*); a whole series of *t* sounds is in this way possible. The early Semitic alphabet distinguished two of the series; the Greeks took one to represent their *t*, and transferred the other, *θ*, to denote *th*.

Th in English is commonly used to denote two different sounds—spirant *t* ('think,' 'thigh') and spirant *d* ('thee,' 'thy'). As a phonetic symbol *th* should represent spirant *t* only; *dh* may be employed for spirant *d*. *Dh* is a voiced *th*, as *d* is a voiced *t*, and the sound *th* often passes into *dh* ('path,' 'paths').

T combined with *i* shows a general tendency to become a sibilant; *tion* in English has become *shon* ('motion'). In such words as 'nature,' *u* is a diphthong commencing with *i*, and *t* is apt to pass into *tsh*.

Semitic *taw*, Greek *tau*, means 'mark.' The early form **X**, a cross, is apparently connected with the name; **T** is a simple modification of it; the modern written forms provide the student of writing with instructive variations. **Π** retains the lower part of **X**. The early form of Semitic *teth* is a cross surrounded by a circle, hence *θ*. It is probably a modification of *taw*; the meaning of the name is unknown.

Taafe, COUNT EDUARD FRANZ JOSEPH VON (1833-95), Austrian statesman, was born at Vienna. In 1867 he became minister of the interior and the mouthpiece of the court party. He was president of the cabinet (1868-70). Afterwards Taafe was repeatedly in and out of power; but he steadily aimed at uniting the various nationalities of the empire into a consolidated whole, and succeeded during several years in holding together a fairly representative Austrian parliament. He showed great tact in dealing with men, and a geniality of manner inherited from his Irish ancestry. In 1893 he resigned. See *Memoirs of the Family of Taafe* (1856).

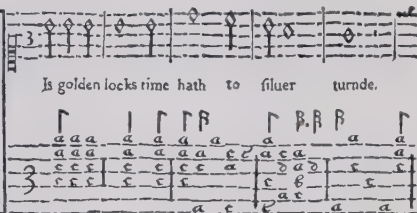
Taal, the name given to the patois spoken by the Dutch in South Africa; it may be described as a degenerate form of the language of the first settlers from Holland. The alphabet possesses only twenty letters, and there are few grammatical rules; the vocabulary also is small. A purer form of Dutch, often also called Taal, is spoken

by the educated classes, and an attempt is being made to have it generally taught in the schools.

Tabard, a garment of rough material formerly worn by the poorest persons. The name was also applied to an outer garment, loose and sleeveless, worn by knights above their armour. Tabard is now a coat worn only by heralds.

Tabari. ABU JA'FAR MOHAMMED BEN JARIR AT-TABARI (838-922), Persian historian, author of a most valuable chronicle, *Anales quos scripsit at-Tabari* (ed. De Goeje, 1879-92). A German translation of that part of the chronicle which affects the Sasanian period of Persian history has been published by Nöldeke (1879) as *Geschichte der Perser und Araber zur Zeit der Sassaniden*. Tabari also wrote a commentary on the Koran. His chronicle was continued by Arib ben Sa'd of Cordova.

Tabashir, or TABASHEER, a



Music with Voice Part and Tablature for the Lute.

white, siliceous secretion found in the joints of certain bamboos and grasses. It is used in the E. Indies as a tonic and astringent medicine. By fusion it is convertible into a transparent glass.

Tabernacle, the movable sanctuary of the Israelites in the wilderness, according to the 'priestly' source of the Hexateuch; it was made according to a divine pattern given to Moses (Exod. 25 ff.). It was an oblong house, thirty cubits long, ten in breadth and height, having a wooden framework and a covering of tapestry and skins, and was divided into the Holy of Holies, containing the ark, and the Holy Place, in which stood the table of shewbread, the golden candlestick, and the altar of incense. Round the whole was the court of the tabernacle, a hundred cubits by fifty, containing the altar of burnt offering and the laver. The place of the desert tabernacle was taken by a more permanent erection at Shiloh (1 Sam. 1:3), and eventually by the temple. The tabernacle of Roman Catholic churches is a receptacle

used for the reservation of the eucharistic elements. See CALDECOTT'S *The Tabernacle, its History and Structure* (1904). For feast of tabernacles, see FEAST.

Tabes Dorsalis. See LOCOMOTOR ATAXIA.

Tablature, the system of musical notation used for the lute. In the usual method the six higher strings of the instrument were represented by six horizontal lines, each named after the note to which the corresponding string was tuned. Letters or Arabic numerals placed on the lines indicated the frets to be used in the production of the notes, the duration of the latter being shown by minims, crotchets, etc., placed over the signs.

Tableaux Vivants ('living pictures'), the representation by means of living persons of scenes from history or fiction, and of works of painting and sculpture. Their invention is ascribed to Madame de Genlis.

Table-land. See PLATEAU.

Table Mountain, or TAFELBERG (3,550 ft.), rises to the S. of Cape Town, Cape Colony, with an abrupt ascent from the S. side of Table Bay, and sloping towards the S. The level nature of the strata gives it its table-like appearance, fancifully increased when the dense white clouds (the 'tablecloth') hang over it, especially in summer.

Tablet, THE, the principal Roman Catholic journal in England, was founded in 1840 by Frederick Lucas, the brother-in-law of John Bright. The present editor is Mr. John Snead Cox.

Table-turning, the turning of a table under the finger-tips, ranged round its edge, of persons surrounding it, the movement being ascribed to the agency of spirits. The name is used also to cover the kindred phenomena of spirit-rapping—i.e. the rapping by alleged spirits on furniture, walls, ceiling. Beginning in America about 1848, table-turning was soon after introduced into Britain, and was often practised as a social pastime. By

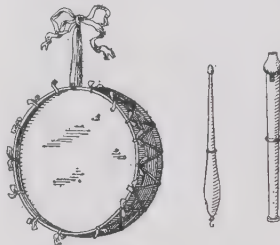
Faraday and other scientific investigators the phenomenon has been accounted for by the involuntary mechanical muscular action of the performers. See SPIRITUALISM.

Tabley, BARON. See DE TABLEY.

Taboo, TABU, TAMBU, or TAPU (the last being the most correct spelling), a complicated Polynesian system of prohibitions, formulated by the priesthood. In many instances the dominant motive is purification; in others the taboo is nothing more than an enactment for preventing the extinction of a certain animal. Among the Maoris any infringement of the laws of taboo is believed to be followed by the death of the transgressor at the hands of the gods. So strong, indeed, is this belief that there are many instances of Maoris dying from sheer fright on realizing that they had touched a tabooed article or had eaten food from a tabooed place. Naturally and logically, such deaths are held by the Maoris to substantiate their belief. The custom of taboo is, however, world-wide. It was fully recognized by the ancient Greeks. Thus, in the Eleusinian mysteries the pomegranate was tabooed; and in the banquet which concluded the *haloo*, or festival of the threshing-floor, the following articles of food were strictly prohibited—pomegranates, apples, domestic fowls, eggs, red mullet, crayfish, black-tail, and shark.

Taboo results also from a feeling of reverence for the dead. The Zulus, for example, always use descriptive names in speaking of their dead kings. The actual name is tabooed (*hlonipa*). 'Then there is the Gypsy system of *tabu*,' remarks F. H. Groome (*Gypsy Folk-Tales*, p. lxxiii.), 'by which wife and child renounce for ever the favourite food or drink of the dead husband or father, or the name of the deceased is dropped clean out of use, any survivors who happen to bear it adopting another.' The many forms of taboo recognized by the Jews are given in detail in the Mosaic law. There, again, the reasons were various. The temporary taboo laid by the priest upon a man suspected of incipient leprosy (Lev. 13) was a purely medical precaution. On the other hand, the taboo laid upon a woman who had just borne a child, the particulars of which varied according to the sex of the child (Lev. 12), was based upon the belief, common to many races, that childbirth rendered a woman 'unclean.' The 'network of prohibitions and observances' with which kings frequently used to be surrounded

owes its origin to the fact that kings were believed to be supernatural beings, whose every action affected the lives and welfare of their people. This question of 'royal taboos' is examined by Dr. J. G. Frazer in his *Golden Bough* (ed. 1900), vol. i., at the end of which volume there is a long and instructive note on 'Taboos on Common Words.' See Van Gennepe's *Tabou et Tolémisme à Madagascar* (1904).



Tabor and Pipe.

Tabor, a small drum, usually played with one stick, in accompaniment to the pipe, both instruments being often played by the same performer.

Tabor. (1.) Town, Bohemia, Austria, 65 m. by rail S. of Prague, the former stronghold of the Hussites. It is still in part surrounded with the walls which Zizka built in 1420. Tobacco, beer, and flour are produced. Pop. (1900) 10,692. (2.) Mountain in Galilee (1,800 ft.), the traditional scene of the transfiguration of Christ, and an object of pious pilgrimage.

Tabora, tn., German E. Africa, in the heart of Unyamwezi, 220 m. E. of Ujiji (Lake Tanganyika), an ivory emporium. Pop. 16,000.

Taborites. See HUSSITES.

Tabriz, tn., prov. Azerbaijan, N.W. Persia, 40 m. E. of Lake Urmia. It was built (791) by the wife of Haroun-al-Raschid, and is the most important commercial centre of N.W. Persia. Exports are dry fruit, raisins, cotton, carpets. The total trade probably exceeds a million sterling per annum. Two important features are the blue mosque and a famous tower built by Greeks. Pop. 200,000.

Tacca, a genus of mostly American tropical herbaceous plants belonging to the order Taccaceae. *T. pinnatifida*, the Otateite salap plant, is the source of South Sea arrowroot, prepared from its tubers. This and other species (*T. integrifolia*, and *T. cristata*) are easily grown in Britain as stove plants. They are usually propagated by root division.

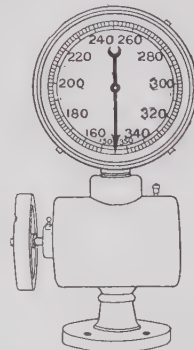
Taché, ALEXANDRE ANTONINE (1823-94), archbishop of Mani-

toba, was born at Rivière du Loup, Quebec, Canada. He volunteered in 1845 for mission service among the Red River Indians, and in 1849 became bishop-coadjutor of St. Boniface (Winnipeg), bishop of Arrouth in *partibus* (1851), bishop of St. Boniface (1853), and archbishop of Manitoba (1871).

Tacheometer. See SURVEYING.

Ta-chien-lu, or TA-TSIEN-LU, tn., Sze-chuen, China, 65 m. S.W. of Tshing-tu, on route to Tibet.

Tachometer, an instrument for giving directly the angular speed of a revolving shaft in revolutions per minute. It is similar in principle to a small Watt governor with its spindle horizontal, the spindle being driven by the shaft whose speed is to be measured. The tendency of the revolving weights to fly outwards is resisted by a spring, the compression of which is indicated by a needle moving round a dial, graduated to read revolutions per minute. In small sizes the spindle has a pointed end, which is pressed into a centre in the end of the revolving shaft, the instrument being held in the hand. Larger sizes are usually driven by a belt and pulley. Where however, the exact speed is required, some form of speed counter should be employed, in which the revolutions are counted by the movements of a train of wheels.



Tachometer.

Tachylite, a dark, basic, volcanic glass, which most frequently occurs as the selvage or margin of basaltic dykes. Tachylite lavas occur in Iceland and the Sandwich Is.; they are sometimes highly vesicular. Basaltic ashes, which consist in great part of spongy fragments of tachylite, are not rare; they usually weather with a deep red crust, and are then known as palagonite tuffs; fragments of palagonite are believed to form a not inconsider-

able part of the abysmal red clays. A very characteristic feature is the presence of spheclinites.

Tacitus. (1.) (c. 55-120 A.D.), Roman historian, whose full name was either Publius or Gaius Cornelius Tacitus. He was quaestor (79), prætor (88), and consul (97). In 78 he had married the daughter of the famous Agricola. It is possible that he was employed in the government of either Germany or Belgic Gaul between 90 and 94 A.D. He was famous as an orator, a fact learned from the letters of his friend the younger Pliny. After his consulship he was chiefly occupied with his literary works. These were *Dialogue on Orators*; *Agricola*, a biography of his father-in-law, published in 98 A.D.; *Germania*, based partly on Cæsar and other authorities, partly perhaps on the writer's own knowledge (it also was written about 98 A.D.); *Histories*, a narrative of the reigns of the emperors from Galba to Domitian inclusive, now incomplete; *Annals*, a history of the empire from the death of Augustus to that of Nero, also incomplete; this work appeared between 115 and 117 A.D. It is in the *Annals* that Tacitus's style attains its full development. The force of his style is marvellous: a single word often conveys the chief effect of a sentence. Many of his maxims have become proverbial. As a delineator of character he is unequalled. It is believed that in the middle ages his writings were destroyed through Christian indignation at his contemptuous reference to Christ (as a malefactor condemned by Pilate). Editions: Text—Orelli (1846), Müller (1887); with notes—*Annals*, Furneaux (1891); *Histories*, Spooner (1891); *Germania*, Furneaux (1894); *Agricola*, Davis (1892); *Dialogue*, Peterson (1893); Eng. trans. (except the *Dialogue*) Church and Brodribb (1888-9). (2.) MARCUS CLAUDIUS TACITUS (c. 205-276 A.D.), was appointed emperor at Rome (275) after the murder of Aurelian. He was famous for his great wealth, devotion to literature, and upright character. His short reign was marked by laws for the improvement of public morals, and by the expulsion from Asia Minor of a body of Goths.

Tack. (1.) The rope used for making fast the foremost corner of a square sail when the wind crosses the ship obliquely; also the rope for stretching the after corner of a fore-and-aft sail to the boom. The tack, therefore, of a square sail extends the sail to windward, while the sheet extends it to leeward. (2.) A ship is said to be on the starboard or port tack when she is close-hauled with the wind on that

quarter. (3.) To tack means to change the course, or go about in a contrary wind from the starboard to the port tack, or *vice versa*. The word is often enlarged so as to cover the whole zigzag movements of a ship when making towards the windward quarter. This movement is properly known as 'beating to windward.'

Tack, in Scots law, means a lease. See LANDLORD AND TENANT.

Tacna, or SAN PEDRO DE TACNA, cap. of prov. of same name, Chile, on river Tacna, 40 m. by rail N. of its port, Arica; has greatly declined since the diversion of Bolivian trade through Antofagasta. Pop. (1895) 9,418. The province covers an area of 9,248 sq. m., and has a population (1895) of 24,160. Much of the interior is arid and unfruitful. Nitrate and some copper and silver are mined. The province was ceded to Chile by Peru in 1884 for ten years, after which a plebiscite was to be taken to determine the ultimate ownership of the provinces of Arica and Tacna. This has not yet been settled.

Tacoma, city, Washington, U.S.A., co. seat of Pierce co., on Admiralty Inlet, an arm of Puget Sound, is one of the principal seaports of the Pacific coast, and exports lumber, fish, and flour. Pop. (1900) 37,714.

Taconian and Taconic System, a group of hills in the United States, part of the Appalachian Mts., on the borders of New York and New Jersey. It consists of Cambrian and Lower Silurian rocks, which were much folded, compressed, and metamorphosed at the close of the Lower Silurian epoch. The use of the term has been discontinued.

Tacsonia, a genus of tropical climbing shrubs belonging to the order Passifloraceæ. They much resemble the passion flowers in habit and appearance, but the flowers are distinguished by their long, cylindrical calyx tubes. Among the best species to cultivate is *T. Van-Volxemii*, a New Granada native, which bears brilliant scarlet flowers in July and August.

Tactics. See STRATEGY AND TACTICS AND NAVIES.

Tacubaya. See MEXICO (city).

Tadcaster (Roman *Calcaria*),

tn., W. Riding, Yorkshire, England, 9 m. s.w. of York. East and West Tadcaster occupy opposite sides of the Wharfe. The church of St. Mary was rebuilt in 1875-7. Brewing and limestone quarrying are the chief industries. Roman remains have been discovered. Pop. (1901) E. 1,134, W. 1,909.

Tadema. See ALMA-TADEMA.

Tadma. See PALMYRA.

Tadoussac. See SAGUENAY.

Tadpole. See FROG.

Tael, a unit of weight constituting the Chinese liang or ounce, equal to 1½ oz. avoird., and a unit of value in China representing a liang of silver bullion. As a money of account it is divided into ten mace of ten candareens each. Its value varies at different places and according to the fluctuations of the bullion. A haikwan (i.e. customs) tael is one tael weight of pure silver, which was equal, in 1903, to 2s. 7½d., or 758 haikwan tael = £1 sterling.

Tænia. See TAPEWORMS.

Taffety, or TAFETA, a name once applied to plain woven silks, and more recently to a light thin silk of a high degree of lustre or gloss, and to various mixtures of silk and wool. It was brought into England about the 14th century.

Tafilet, or TAFILET, oasis (500 sq. m. in area), in N.W. Sahara, on the S. side of Atlas Mts., 220 m. S. of Fez, and under government of Morocco; is a caravan centre, and noted for its dates. Pop. 100,000.

Taganrog, tn. and port, Don Cossacks Territory, S. Russia, 35 m. W. of Rostov-on-Don, and on Sea of Azov. It is an episcopal see. There are tanneries, macaroni and tobacco manufactories, tallow foundries, fisheries, salting industries. The principal export is grain. The total trade amounts to about £350,000 per annum. Pop. (1900) 60,678. Taganrog is near the site of the 13th-century Porto Pisano.

Tagliacozzo, BATTLE OF. Charles of Anjou had, with the aid of the popes, conquered the kingdom of Sicily. Conradin, grandson of the Emperor Frederick II., and last of the Hohenstaufen family, invaded Italy to recover his inheritance. Defeated by Charles at Tagliacozzo (1268) in Abruzzi, he was afterwards taken prisoner, and executed as if he had been a rebel.

Taglioni, MARIA (1804-84), dancer, was born of Italian family at Stockholm. She made her début at Vienna (1822), and her appearance in Paris (1827) created a great sensation, which was repeated when she appeared in London (1829). She reigned queen of her profession till the advent of Fanny Elssler. Taglioni regarded the ballet as the centre of an opera. She retired from the stage in 1847. Having lost her fortune, she settled in London (1863) as a teacher of deportment.

Tagus, chief riv. of the Iberian Peninsula, rises in Sierra Albaracin, S.W. of Teruel prov., Spain, and flows 566 m. mainly W.S.W., at first rapidly, and then more quietly and with a more S.S.W. course through Portugal. At Villafranca it begins to widen out into a magnificent estuary.

which passes Lisbon to the Atlantic. Navigation is possible for large vessels to Santarem, and for small ones to Abrantes; rapids impede navigation through Spain.

Tahiti, or OTAHEITE, the largest of the Society Is., E. Pacific, 17° 40' S. and 149° 20' W., covers 402 sq. m., and has been a French possession since 1888. The centre is mountainous, of volcanic origin, and covered with luxuriant vegetation; the coast lands are extremely fertile. Cocoanuts, oranges, sugar, and vanilla are produced, sugar and rum are manufactured, and copra, mother-of-pearl, and vanilla are exported. Trade (total, £300,000) chiefly with the United States. The capital is Papeete. Pop. (1900) 10,750.

Tail. See ENTAIL.

Taillandier, SAINT RENÉ (1817-79), French man of letters, whose real name was René Gaspard Ernest, was born at Paris. He was professor of literature at Strassburg (1841), Montpellier (1843), and the Sorbonne, Paris (1863). He became an academician in 1873. His chief works are *Histoire de la Jeune Allemagne* (1849), *Etudes sur la Révolution en Allemagne* (1853), *Allemagne et Russie* (1856). He also wrote *Scot Erigène et la Philosophie Scholastique* (1843), *Histoire de la Philosophie Religieuse* (1860), *Dramas et Romans de la Vie Littéraire* (1870), *Etudes Littéraires* (1881); and was a regular contributor to the *Revue des Deux Mondes*.

Taille, in pre-revolutionary France, a sort of income tax levied upon the land and houses of the unprivileged classes, but especially of the peasant farmers. Its injustice consisted in (1) the immunity of the 'privileged' or richer classes, and (2) the vexatious and despotic way in which it was collected. It was abolished at the revolution.

Taillefer, a Norman minstrel, who at the battle of Hastings rode forth singing of Roland and Charlemagne. After displaying some juggler's feats, he pierced one Englishman with his lance, struck down another, and then himself fell under English blows.

Tailor-bird (*Orthotomus sutorius*), a small Asiatic bird belonging to the Sylviinae. To make its nest, two or three leaves are stitched together with silk, wool, or vegetable fibre, and within the space so formed the nest proper is constructed of cotton, grass, and hair. The bird is coloured in greenish-brown, and the two central feathers of the tail are greatly elongated.

Tain, roy. and parl. bur., co. Ross and Cromarty, Scotland, near S. shore of Dornoch Firth, 44 m. N.N.E. of Inverness, with a

distillery and woollen mills. The collegiate church of St. Duthus was founded in 1360. In its chapel the wife and daughter of Robert the Bruce found sanctuary in 1306. The public buildings include the academy (1812), the court-house, the public hall (1875), and the free library (1904). Pop. (1901) 2,076.

Tainan, formerly TAIWAN-FU, tn., S.W. Formosa, Japan, 3 m. E.S.E. of Anping. It has rice and sugar mills. Pop. 48,997.



Tailor-bird.

Taine, HIPPOLYTE ADOLPHE (1828-93), French literary historian, critic, and man of letters, born at Vouziers, dep. Ardennes. He was provisionally appointed to the chair of philosophy at Nevers (1851). After the *coup d'état* he resumed his chair, and devoted himself to literature (1852). His *Histoire de la Littérature Anglaise* appeared in 1863, being preceded (1857) by a volume on the French philosophers, in which he adversely criticised Victor Cousin. He was appointed (1864) professor of the history of art and aesthetics at the Ecole des Beaux-Arts. He lectured at Oxford in 1871, and was elected a member of the Academy in 1878. The last thirty-two years of his life were devoted to *Les Origines de la France Contemporaine*, of which he lived to complete only a part. Most important of his other books are — *Essais de Critique et d'Histoire* (1858); *La Fontaine et ses Fables* (1860); *La Philosophie de l'Art* (1865); *Nouveaux Essais de Critique et d'Histoire* (1865); *La Vie Parisienne* (1863-5); *L'Ideal dans l'Art* (1867); *Théorie de l'Intelligence* (1870); *Philosophie de l'Art in Italy, Greece, and the Netherlands* (1868-70); *L'Ancien Régime* (1875); *La Révolution* (1878-85); *Le Régime Moderne* (1890); *Derniers Essais de Critique et d'Histoire* (1894). His *Littérature Anglaise* was translated into English by H. Van Laun (1871), and has had great

vogue both in Britain and in America. See G. Monod's *Renan, Taine, et Michelet* (1894); A. de Margerie's *H. Taine* (1894); E. Boutmy's *H. Taine* (1897); and Giraud's *Essai sur Taine* (1901).

Tai-ping Rebellion, an uprising in China, started in 1851 to expel the Manchus from China. From 1853 China's fairest provinces passed beneath the sway of the rebels. In 1862, the Taipings advanced upon Shanghai in overwhelming force. It was then that Major (afterwards General) Charles Gordon ('Chinese' Gordon) took command of the Chinese army, remodelled the force, and led it through a series of victories to the gates of Nan-king, which was wrested from the rebels on July 19, 1864, and a final blow dealt to the rebellion. See Brine's *The Tai-Ping Rebellion in China* (1862); Wilson's *Gordon's Chinese Campaign and the Tai-Ping Rebellion* (1868), and Hake's *Events of the Tai-Ping Rebellion* (1892).

Tait, ARCHIBALD CAMPBELL (1811-82), archbishop of Canterbury, born in Edinburgh. He was elected a fellow of Balliol College, Oxford, in 1834, and succeeded Arnold at Rugby in 1842. He became dean of Carlisle in 1849, and bishop of London in 1856. He was made archbishop of Canterbury in 1869. See *Life* by Davidson and Benham (1891).

Tait, PETER GUTHRIE (1831-1901), Scottish physicist and mathematician, was born at Dalkeith. He graduated as senior wrangler and first Smith's prize-man at Cambridge in 1852, and in 1854 became professor of mathematics in Belfast. In 1860 he was appointed professor of natural philosophy in the University of Edinburgh, and there remained till his death. Besides experimental researches on thermal conductivity, thermo-electricity, the effect of pressure on the readings of thermometers, on the maximum density of water, and on the flight of golf balls, Tait's principal work was in the domain of pure mathematics and mathematical physics, and includes memoirs on quaternions, the kinetic theory of gases, theory of knots, and other subjects, his papers having been collected and reprinted by the University of Cambridge (1898). He also published treatises on *Light* (1884), *Heat* (1884), *Properties of Matter* (1885), *Dynamics* (1895), and, in collaboration with Lord Kelvin, wrote the first volume of *Treatise on Natural Philosophy* (1867). With W. J. Steele he published *The Dynamics of a Particle* (1856); and with Balfour Stewart, *The Unseen Universe* (1875). Tait was secretary of the Edinburgh Royal Society from 1879.

Tait, ROBERT LAWSON (1845-99), Scottish surgeon, was born in Edinburgh. He was associated with Sir James Y. Simpson as assistant, and early manifested great powers of observation and great surgical skill. In 1870 he settled in Birmingham, where he became a professor of gynecology and one of the foremost exponents of abdominal surgery. He was the first to insist on the importance of the 'toilet of the peritoneum,' and was a pioneer of asepticism as a corollary of Listerism.

Tait, WILLIAM (1793-1864), Scottish publisher, was born in Edinburgh, where he issued, among other works, Brown's *Philosophy of the Human Mind*, Carlyle's *German Romance*, Bentham's *Works*, and Tytler's *History of Scotland*. Tait's *Edinburgh Magazine* (1832-46) was influential in moulding Scottish Radical opinion.

Tai-yuan-fu, cap. of prov. Shan-si, China, on l. bk. of Fen R. On July 9, 1900, all the resident missionaries, with their wives and children, were put to death in the governor's yamen.

Tajiks, the settled Persian-speaking populations of Central Asia. They represent the dominant cultured element under the Persian empire before its overthrow by the Mongolo-Turki hordes, and are still numerous in all the towns and settled districts.

Taj-Mahal, a magnificent mausoleum, the most beautiful monument of Mohammedan art, rising from a marble platform on the bank of the Jumna, at Agra in India. It is built entirely of white marble, and internally is adorned with mosaics of cornelian, lapis lazuli, and jasper, arabesques, Koran texts in black marble on columns and ceilings. It was erected (1629-49) by the emperor Shah-Jehan as a memorial of his favourite queen.

Takla-makan Desert, western section of the Gobi desert, occupying the interior of E. or Chinese Turkestan, with an extreme length (E. to W.) of about 600 m., an extreme breadth (N. to S.) of about 250 m., and an area of about 100,000 sq. m. It is bordered on the W., N., and N.E., by the Tarim; on the E. by the Lob Nor depression and the prolongation of the desert (by a sort of isthmus) into the Central Gobi; on the S. by the Kuenlun and Altyn-tagh. Sven Hedin's explorations show that two thousand years ago it was a fertile region, and the centre of a great Buddhist civilization. See Keane's *Asia* (new ed. 1906).

Takow, treaty port, in S.S.W. of Formosa, Japan, 20 m. by rail S. of Tainan; exports rice and sugar. Pop. 7,000.

Taku Forts, Chi-li, China, at mouth of Pei-ho. Taken by an Anglo-French force, May 1858; unsuccessfully attacked, June 1859; captured, August 1860; taken by European allied forces, June 1900. The water on bar is 14 feet at spring tides.

Talamancans, Central American aborigines, formerly dominant in Costa Rica and the Panama peninsula. Nearly all are still in the tribal state. Physically they closely resemble the Mayas of Yucatan, and, like them, are a guileless, peaceable people.

Talavera de la Reina, city, prov. Toledo, Spain, 40 m. W.N.W. of Toledo; site of the battle in which Wellington defeated Joseph Bonaparte (July 28, 1809). There are silk-weaving and pottery industries. Pop. (1900) 10,580.

Talbot, CATHERINE (1721-70), English author, was the granddaughter of the bishop of Durham. She wrote *Reflections on the Seven Days of the Week* (1770); *Essays on Various Subjects* (1772); *Dialogues, Pastorals, and Poems*. See Elwood's *Literary Ladies*, i. 127-43 (1843).

Talbot, CHARLES. See SHREWSBURY, DUKE OF.

Talbot, JOHN. See SHREWSBURY, EARL OF.

Talbot, RICHARD. See TYRCONNEL, DUKE OF.

Talbot, WILLIAM HENRY FOX (1800-77), English pioneer of photography, born in Chippenham, Wiltshire. In 1833 he discovered the process of photography, but did not announce it till 1839. Daguerre announced a similar discovery in January 1839, but the Talbotype eventually took the lead. Talbot's writings include *The Pencil of Nature* (1844-46); *Legendary Tales* (1830).

Talc, a magnesium silicate, $H_2Mg_3(SiO_3)_4$, is a silvery white, very soft mineral (h. = 1, sp. gr. 2.7). It is easily cut, has a greasy feel, and is also known as steatite, or 'soapstone,' and when powdered yields French chalk. It is used as a lubricant, as a filler for paper, and for tailor's chalk. It is heat-resisting and non-conducting.

Talcuano. See CONCEPCION.

Talchir Beds, in geology, a group of rocks in India, chiefly shales and sandstones, extending across the peninsula from the Godavari to the Vindhya Mts. They contain few fossils, and are probably of Permian age.

Talegalla (*Talegallus*), a genus of mound-birds. The name is sometimes applied to the brush-turkey of Australia (*Catharturus lathamii*), which is now referred to a different genus.

Talent, a definite weight, and then a certain sum of money, the value of the given weight in silver

or gold. It seems to have been adopted by the Greeks from the Babylonians or Assyrians. In the 6th cent. B.C. two talents were in use—the Babylonian or Æginetan, and the Euboic; the former was used in weighing silver, the latter in weighing gold. The former silver talent was used by most Greek states; Solon, however, reduced the Attic weights and coinage by making the standard a silver talent equal in weight to the one previously used for gold, the Euboic. The Attic talent weighed about 57.75 lbs. avoirdupois; its value may be taken as equal to about £225 of our money. See Ridgeway's *Origin of Metallic Currency and Weight Standards* (1892).

Talé-Sap, or TONLÉ-SAP, lake, Indo-China, partly in Cambodia, partly in Siam. In the dry season its area shrinks to 100 sq. m., and its depth from 6 to 2 ft. During the annual overflow of the river the lake expands to 800 sq. m., and a depth of 50 ft. Talé-Sap supports a fishing population of about 30,000.

Talfourd, SIR THOMAS NOON (1795-1854), English judge and author, born at Reading. He was called to the bar in 1821. Among his works are *Memorials of Charles Lamb* (1848); *Ion*, a tragedy (1836); and dramas.

Talienwan, bay on E. side of the Liao-tung peninsula, Manchuria, China; leased, along with Port Arthur, by Russia from China, in 1898, for twenty-five years, but acquired by Japan after the Russo-Japanese war. It is roomy, well protected, and free from ice. See also DALNY.

Taliesin (fl. 550), bard of the Cymry, is held by many scholars, including Professor Rhys, to be a purely mythic personage. Most of the poems included in the 'Book of Taliesin' (printed by Skene in the *Four Ancient Books of Wales*, 1868) are of much later date than the 6th century. The poems are of the prophetic and occult class. See Lady Charlotte Guest's *Mabinogion* (1849) and Stephens's *Literature of the Kymry* (1849).

Tali-fu, city, prov. Yün-nan, China, between Lake Erh-hai and the snow-capped Tsang-shan (alt. 6,670 ft.). On the surrender of the Mohammedan rebels in 1873, the population was almost exterminated by Chinese troops.

Talisman. See AMULET.

Talking Machines are those which record and reproduce sound, though the term also includes machines which imitate sounds merely without recording or reproducing them, such as speaking dolls and other vocal or musical automata. Those machines which actually record and reproduce sound are divided into two classes

—cylinder and disc. The phonograph and graphophone are cylinder machines. The Edison phonograph, as invented in 1877, registered vertically the sound vibrations on tinfoil. Engraving on wax was introduced a little later by Mr. Sumner Tainter and Professor Alexander Bell. Emil Berliner conceived the idea of engraving on a flat plate, instead of a cylinder, about the same time. The making of a record consists in focussing the waves of sound by means of a horn or cone. By talking, singing, or playing into the mouth of this cone vibrations are set up upon a diaphragm of a highly sensitive material, generally glass or mica, at the other end of the cone. These vibrations are in turn communicated to a stylus, or point, which traces them on the wax. Thus the master record is made. Copies of this are made by moulding or by engraving in the cylinder record, by stamping them out in the disc. These copies do not reproduce the vibrations so well as the original. The recording stylus to both disc and cylinder records has a cutting point; in reproducing, it has a blunt point—in the case of the cylinder generally a sapphire one. This blunt point travels over the indentations made in the cylinder record, and the vibrations of the stylus are again reproduced through the responsive vibrations of a mica or glass diaphragm coming out through the horn, which increases the volume of the sounds given forth in proportion to its size. The horn used for reproduction differs from the horn used for recording. The former, as a general rule, opens out in what is known as a flare, at the end farthest from the diaphragm, so as to distribute the sounds reproduced. The recording horn has no flare. In reproduction from the disc record a tempered steel needle is used, which, travelling in the lateral channels of the record, reproduces the sounds through the diaphragm.

The chief parts of a cylinder machine are: the mandrel, a metal cylinder on which the hollowed out record is placed; the reproducer or diaphragm; and the spring. When wound, the spring causes the mandrel, and with it the record, to revolve. As it rotates the reproducer travels along the surface of the record line by line until the end is reached. The difference between the cylinder and the disc machine is, that in the latter instead of a mandrel we have a turn-table on which the disc record or plate is superimposed. It should be held in place by a clamp screw. A steel needle is also used for reproduction instead of a sapphire point. The com-

mercial talking machine has been used for several years by the reporters of the House of Representatives, and in some of the courts in the United States. Instead of dictating to a stenographer, the reporter or man of business speaks into a talking machine. The record thus made is then given to the typist, who places it on a machine, and by means of hearing tubes placed in the ears transfers the contents of the record to the typewriter. All commercial talking machines are cylinder machines. The French Court of Appeal decided, on Feb. 1, 1905, that the reproduction of copyright works by the machine, whether with or without music, was an infringement of such copyright. The point has not been tested in Britain, though, in February 1899, a firm of British music publishers were unsuccessful in an appeal against a decision of the court below that piano rolls for piano players were an infringement of copyright.

The *auxetophone* is a machine designed to increase the volume and mellow and improve the quality of the sounds given out by talking machines. An essential part is a valve, actuated by the stylus or needle of the machine, which controls the emission of compressed air from a reservoir. The blasts of air are admitted to the trumpet of the machine and set up the same waves in the atmosphere as is done by the diaphragm of the ordinary machine, but in an exaggerated degree. The appliance is the invention (1905) of the Hon. C. A. Parsons and Mr. Horace Short.

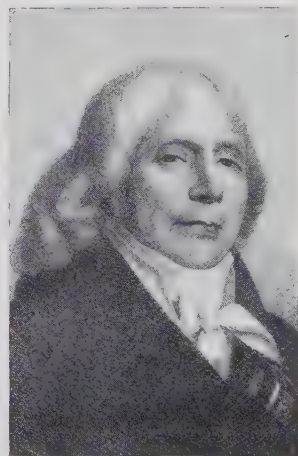
Tallage, a tax imposed on the towns and demesne lands of the crown under the Norman kings of England. Last levied in 1332, the impost was abolished in 1340.

Tallahassee, city, Florida, U.S.A., co. seat of Leon co., and the cap. of the state, 20 m. s. of the boundary with Georgia. Pop. (1900) 2,981.

Tallemant des Réaux, GÉDÉON (1619–1701), French man of letters, was born at La Rochelle. His principal work, the *Historiettes* (c. 1659; ed. by Monmerqué, 1840) gives a valuable picture of contemporary society, his biting satire sparing nobody. He was admitted to the academy in 1666.

Talleyrand de Périgord, CHARLES MAURICE, PRINCE DE BENEVENTO (1754–1838), French statesman and diplomat, was born in Paris. He was made an abbé when twenty-one, agent-general (financial) to the French clergy five years later, and bishop of Autun in 1789. Becoming a member of the States-general in that year, he was accepted as a leader of the advanced party, pronounced

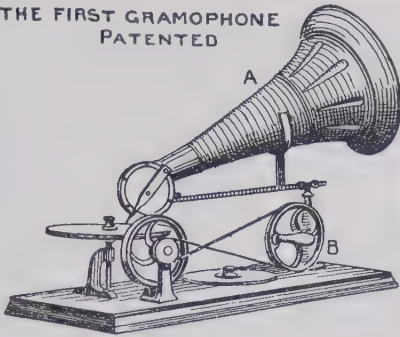
for amalgamation with the *Tiers Etat*, helped to draw up the Declaration of Rights, and proposed the confiscation of the landed property of the church. Being in reality either a political sceptic or a believer in a constitutional monarchy, he went all the way with the revolutionists, suffered excommunication by the papacy, and unfrocked himself. But he rendered notable service to France by his criticisms of the finance of the reformed state, and particularly by a report on public instruction which was epoch-making. In 1792 he was sent to London to win over Pitt and his master to the revolution; but the September massacres came between, and the mission was a failure. The ambassador came under Robespierre's suspicion and



Prince Talleyrand de Périgord.

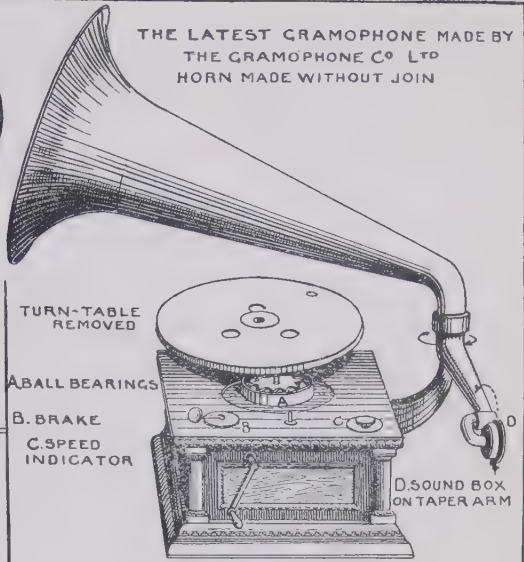
was proscribed. He visited America before the fall of the 'Incorruptible' in 1795 permitted him to return to France. Then he attached himself to Barras, and within two years had attained the dignity of foreign minister under the Directory. His contributions to the defence of France and the consolidation of the Napoleonic power were of the first importance. He conducted the negotiations for the peace of Lunéville and the peace of Amiens, and brought about the concordat, in return for which the pope removed his ban from the ex-bishop. He practically broke with the emperor, however, after the peace of Tilsit (1807), and came by degrees to be the leader of the opposition. It was he who dictated Napoleon's deposition to the Senate, and brought back Louis XVIII., whose foreign minister he became. He negotiated the treaties which saved

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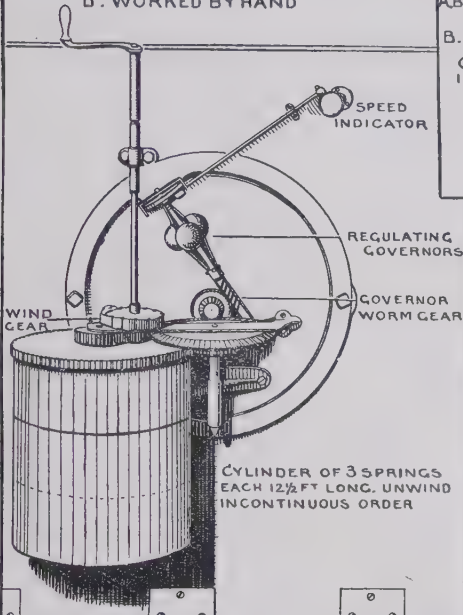
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B. BRAKE

C. SPEED
INDICATOR

D. SOUND BOX
ON TAPER ARM



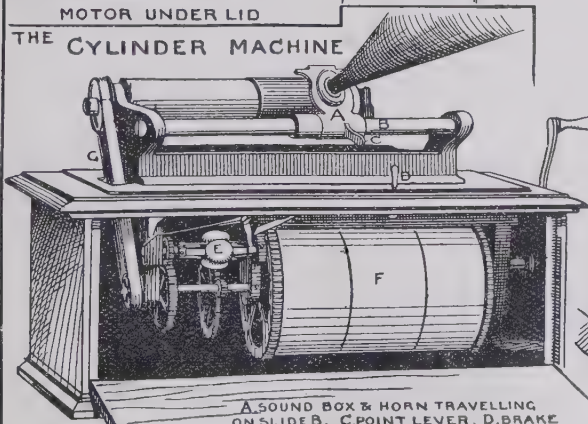
REGULATING
GOVERNORS

GOVERNOR
WORM GEAR

CYLINDER OF 3 SPRINGS
EACH 12½ FT LONG. UNWIND
IN CONTINUOUS ORDER

MOTOR UNDER LID

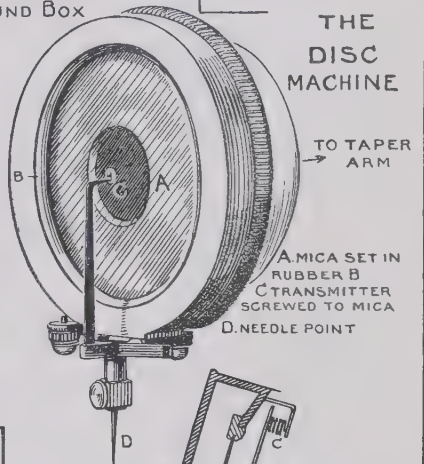
THE CYLINDER MACHINE



A. SOUND BOX & HORN TRAVELLING
ON SLIDE B. C. POINT LEVER. D. BRAKE
E. GOVERNORS. F. MAIN SPRINGS & DRIVING BAND

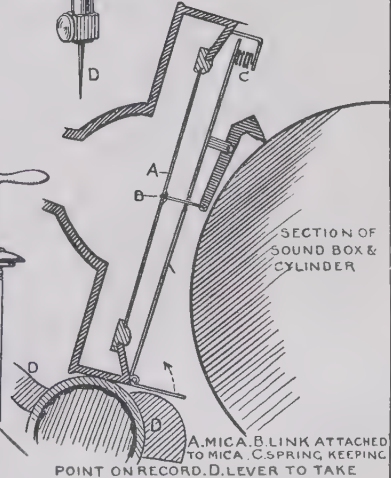
SOUND BOX

THE
DISC
MACHINE



TO TAPER
ARM

A. MICA SET IN
RUBBER B.
C. TRANSMITTER
SCREWED TO MICA
D. NEEDLE POINT



SECTION OF
SOUND BOX &
CYLINDER

A. MICA. B. LINK ATTACHED
TO MICA. C. SPRING KEEPING
POINT ON RECORD. D. LEVER TO TAKE
POINT OFF RECORD.

the territorial integrity of France. The 'hundred days' were fatal to him, and he retired into private life. The revolution of 1830, however, brought him again to the front, and Louis Philippe sent him to London as ambassador. Carlyle said of Talleyrand that he was 'a man living in falsehood and on falsehood, yet not what you call a false man.' His most notable crime was compassing the death of the Duc d'Enghien. See *The Talleyrand Memoirs* (1891-2), Pullain's *Correspondance entre Talleyrand et Louis XVIII* (1881), *Correspondance Diplomatique de Talleyrand* (1889-90), Lady Blennerhassett's *Talleyrand* (1894).

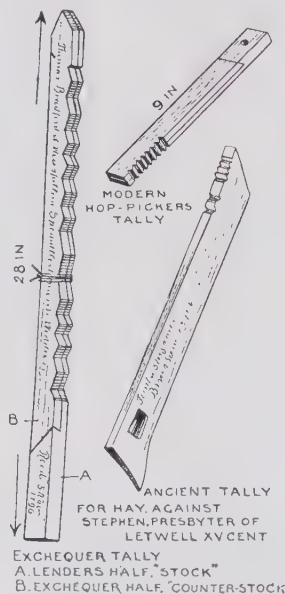
Tallien, JEAN LAMBERT (1769-1820), French revolutionist, was born at Paris. In 1791 he became editor of the Jacobin *L'Ami des Citoyens*, and was secretary to the municipal council of Paris. The Seine-et-Oise department elected him to the Convention. He voted for the execution of Louis XVI. He was also a member of the Committee of General Security, and assisted in the downfall of the Girondists (June 2). At Bordeaux he earned a reputation for pitiless severity, till a love affair with the Comtesse de Fontenay apparently effected a change in his nature. On March 22, 1794, he was president of the Convention at Paris. He was for a while second to none in influence, but his power ended with the Convention. He accompanied Bonaparte to Egypt (1798), and edited the official *Décade Egyptienne* at Cairo. Captured on the way back by an English man-of-war, he spent some time in England, where the Whigs used him for political purposes.

Tallis, THOMAS (1510?-85), English musician, first appears as organist at Waltham Abbey at the time of its dissolution (1540). Some of his compositions appear in Day's *Psalter* (1560), and in 1576 he and a William Byrd were granted by Queen Elizabeth a monopoly of music-printing for twenty-one years, and in the same year was published the *Cantiones Sacre*. His 'First Service' appeared in Barnard's *Selected Church Musick* (1641), and the Oxford movement led to the publication of many of his works. His gigantic motet for forty voices was edited by Dr. Mann in 1888.

Tallow is composed of the glycerol esters of stearic and oleic, as well as some palmitic, acids, along with more or less of the free acids themselves. It is separated from the connective tissue, principally of beef and mutton, by melting or 'rendering,' either by fire heat in open vessels, or by steam under pressure in closed iron cylinders. The latter gives the greater yield.

Tallow is in general a white to yellow stiff grease, which is almost odourless when fresh, but acquires a disagreeable smell when exposed to the air. It melts at about 45° C., and is hydrolyzed when acted on by either superheated steam or boiling solutions of acids or alkalis, fatty acids and glycerol being formed. Tallow is used as a lubricant and in the preparation of soap, and is largely converted into fatty acids from which stearine candles are manufactured. It is often adulterated with the fatty acids from cotton seed and wool grease, and with mineral substances, such as clay, whiting.

Tallow Tree (*Pentadesma butyracea*), a native of tropical Africa, whence it was introduced into Britain in 1822. It belongs to the order Guttiferae, and bears large, brilliant red flowers, followed by edible berries. It is occasionally cultivated in the stovehouse, requiring a peaty soil and a strong heat. The Chinese tallow tree is *Excoecaria sebifera*, belonging to the order Euphorbiaceae. The Chinese use its wood for engraving-blocks. A kind of tallow is obtained from the seeds.



Examples of Tallies from the British Museum.

Tally, a method of recording numbers adopted in all countries, used for centuries in the Court of Exchequer of England, and still in use, it is said, among fishermen. Let a hazel stick have cut transversely into it as many notches as there are figures to be recorded.

To distinguish 1d., 1s., £1, or any multiple thereof, the notches are cut of different breadths. Let the stick be then split down the middle through all the notches. One half of the stick is then held by one party to the transaction, the corresponding half by the other. After the disuse of wooden tallies, tickets, cheques, and other documents came to be cut or torn by an irregular line of separation, and the fact of the cut edges tallying was evidence of the validity of the claim. An act (1783) abolished tallies in the English Exchequer, but their use lingered till about 1820. 'Teller' of the Exchequer was originally 'tallier.' The conflagration of the houses of Parliament in 1834 was caused by the combustion of tallies accumulated for centuries.

Tally System, a mode of dealing practised in London, by which customers are supplied with articles, mostly drapery, furniture, or hardware, on credit, under agreement to pay the stipulated price by fixed instalments weekly or monthly. The 'easy hire system' is a development of the tally system.

Talma, FRANÇOIS JOSEPH (1763-1826), French tragic actor, born at Paris, made his début on the stage in 1787. Later, in the rôle of Proculus in Voltaire's *Brutus*, he created a sensation by appearing in a Roman toga. He equally corrected the bombastic style of delivery then conventional for the tragic actor. Secretary of the Théâtre Français (1789), he won a brilliant triumph as Charles IX, in Chenier's play. Having founded the Théâtre de la Nation, Talma continued playing throughout the reign of terror. To the end his career was an uninterrupted series of triumphs. See *Mémoires*, by Dumas (1849-50).

Talmage, THOMAS DE WITT (1832-1902), American preacher and lecturer, was born at Bound Brook, New Jersey. Possessed of a vivid imagination and considerable force of picturesque declamation, he was a well-known figure in Brooklyn from 1869 to 1894. His books and sermons were very widely read, especially among nonconformists, in Britain. When he visited England on a lecturing tour, vast crowds thronged to hear him at first; but they rapidly fell off, and the tour came to a less prosperous end.

Talmud, a collection of works which comprise the oral, as distinguished from the written, law of the Jews. The beginning of this was probably in the exile, when the law became the centre of Jewish religion. Then the synagogue arose and sought to interpret the word of God, their na-

tional inheritance. Such interpretation is called Midrash, and is of two kinds. The Midrash which interprets the legal and ritual passages is the Halakha—i.e. a practical rule or a legal decision. The Midrash which comments on didactic passages is the Haggada—i.e. a homily or tale. But the latter came to comprise varied elements from scraps of history, legends, lives of post-biblical Jewish saints, to disquisitions on magic. The following schools were active in this task:—

(1.) The Sopherim or scribes, from Ezra to the Maccabees, 450-100 B.C., including the men of the 'great synagogue.' The very existence of the great synagogue has been questioned, and its character is uncertain. The work of these men has been so overlaid with tradition that it is impossible to determine with certainty rules which date from this time. The description, for example, 'words of the scribes,' is frequently attached to Halakhoth, but the Halakhoth so described date from different and often from later generations. The phrase implies, not that the decisions so described were written by the Sopherim, but that they were supposed to have their authority.

(2.) The five Zugoth or pairs, during the Maccabean and Herodian periods, 150-30 B.C. According to tradition, each 'pair' represents the president and vice-president of the Sanhedrin in their generation. The most important were Hillel and Shammai, who became the founders of two schools. Hillel, in particular, sought to guide the process of interpretation.

(3.) The Tannaim or teachers, 10-200 A.D., ending with Rabbi Jehuda, the great-grandson of Hillel. One of these founded the Academy of Jamnia, a centre of Jewish thought after the temple had been destroyed. With the close of this period a definite stage in the growth of tradition was reached, for Rabbi Jehuda compiled the Mishna. There are a few later elements added to the Mishna, but in general it sums up the outcome of the activity of the Sopherim, Zugoth, Tannaim. This became the canonical book of the oral law, as the Pentateuch had become the canonical book of the written law. And round it in its turn gathered the comments of later scribes.

(4.) The Amoraim or debaters, A.D. 220-500. These expounded the Mishna. Their labours form the Gemara; the united Mishna and Gemara form the Talmud. By this time and even earlier the teachers of Judaism were

also working in the schools of Babylonia. Hence the Talmud exists in two forms—the Palestinian Talmud or Talmud of Jerusalem, and the Babylonian Talmud. The Gemara thus develops the Mishna, and its expansions are mostly concerned



Tamarind.

1, Gynaeceum; 2, pod; 3, seed.

with civil law. But the book is much more than a law book; it is rather an encyclopædia, into which have been poured all the gathered knowledge and crudities of generations. Often the text is no subject for exposition in any strict sense, but a peg on which to hang every kind of legendary and historical material. In this respect the Babylonian Talmud is peculiarly rich.

Bibliography.—Editions—*Mishna* (1492); *The Mishna*, by W. H. Lowe (1883); *Babylonian Talmud* (1520). The best and last is the Wilna edition (25 vols. 1880-86). Translations—A. Wünsche's *Der Babylonische Talmud in seinen haggadischen Bestandtheilen* (1886); *Der Babylonische Talmud* (1888); Bacher's translations of the *Agada* (1892-99). Introductory—Strack's *Einführung in den Talmud*, (1900); Mielziner's *Introduction to the Talmud* (1894); more popular, E. Deutsch's *The Talmud* (1895).

Talos, a man of brass, wrought by Hephaestus, and given by him to Minos to guard the island of Crete; he killed strangers by embracing them after he had made himself red hot in the fire. When the Argonauts in their wanderings came to Crete, and he resisted their landing, Medea killed him.

Talpidæ, the mole family. See MOLE.

Talus, the accumulation of detached and broken rock frag-

ments which gathers at the base of cliffs with precipices, forming a gentle slope below the perpendicular rock walls.

Tamaqua, tn., Schuylkill co., Pennsylvania, U.S.A., on Little Schuylkill R., 17 m. N.E. of Pottsville; with coal-mining. Pop. (1900) 7,267.

Tamar, riv., Cornwall and Devon (England), rises in N.E. Cornwall, and flows S. between the two counties to Plymouth Sound. Length, 60 m. (navigable to Launceston).

Tamarind, the fruit of a tropical tree, *Tamarindus indica*, belonging to the order Leguminosæ. It grows in the E. and W. Indies. The flowers, which are borne in loose racemes, are yellow, with red markings.

Tamariscinacæ, a natural order of mostly shrubby plants, occurring chiefly in temperate regions. They have small, often scalelike leaves, and bear usually small, fleshy white or pink flowers. They contain resin and tannin as well as a bitter principle. The order embraces five genera—*Hololachne*, *Myricaria*, *Fouquieria*, *Reaumuria*, and *Tamarix*.

Tamarisk, or **TAMARIX**, a genus of shrubs and small trees belonging to the order Tamariscinacæ. The common tamarisk is *T. gallica*, a hardy shrub which is a useful British seaside plant. From a variety of this plant the saccharine substance manna is produced. It is easily propagated by cuttings.



Tamarisk.

1, Leaves; 2, flower; 3, stamens and pistil.

Tamatave, chief port on E. coast of Madagascar, 145 m. N.E. of Antananarivo. Its roadstead is exposed, and has had boliding ground. Its trade in 1904

amounted to about £800,000. Pop. 15,300.

Tamaulipas, maritime state of Mexico, on Gulf of Mexico, and bounded on N. by Texas, with an area of 32,128 sq. m.; has cattle-rearing, hides and live stock being exported. The capital is Ciudad Victoria. Pop. (1900) 218,948.

Tamayo y Baus, MANUEL (1829-98), Spanish playwright, was born at Madrid. His earliest poem, *Juana de Arco* (1847), was adapted from Schiller. *Angeles* (1852) also owes much of its motif to Schiller's *Kabale und Liebe*. *Virginia* (1853) brought Tamayo into general notice, and *La Locura de Amor* (1855) secured him a wide popularity. In 1863 he attacked duelling in his *Lances de Honor*. *Un Drama Nuevo* (1867) introduces Shakespeare and Yorick, and is one of Tamayo's best achievements. *Los Hombres de Bien* (1870) was his last work. He was elected member of the Spanish Academy in 1859. His *Obras* were published in 1898-9.

Tambourine, a form of percussion instrument. It consists of a wooden hoop covered on one side by a vellum head, and in the hoop are several large perforations containing small brass plates or bells so adjusted that they jingle when the instrument is held in the one hand and struck by the other. The tambourine was used in military bands at one time, and is occasionally employed in the orchestra.

Tambov. (1.) Government, Central Russia, has an area of 25,710 sq. m., and a population (1901) of 2,907,519. The surface is flat, in parts undulating, and belongs to the Don and Volga (Oka) basins. Lakes are numerous and extensive; marshes play a still greater part. The chief mineral deposits are coal, gypsum, potter's clay, and peat. The soil belongs mainly to the 'black earth' zone. Corn, flax, hemp, beet-root, tobacco, and potatoes are grown. The industries include distilleries, tanneries, sugar refineries, iron and tallow foundries, and manufactures of cloth, paper, tobacco, and cordage. (2.) Town, Central Russia, cap. of above gov., 155 m. S.W. of Penza, is an archiepiscopal see. It has manufactures of tallow, soap, candles, woollens, sailcloth, tobacco, oil, and tiles; iron foundries, distilleries, breweries, alum works. Pop. (1901) 49,208.

Tamerlane. See TIMUR BEG.

Tamil, a Dravidian language spoken by over sixteen millions of people. Yerukala or Korava, Kasuwa, and Irula, which are rude dialects of Tamil, are spoken by about 39,000 people. The region in which Tamil is spoken extends from the north of Ceylon to a little north of

Madras. Malayalam is another Dravidian speech allied to Tamil: See Pope's *Handbook of the Tamil Language* (1883), *Sacred Kurral* (1886), *Naladiyār* (1892), *Tiruvācakam* (1900); P. S. Pillai's *Some Milestones in the History of Tamil Literature* (1895).

Tammany Hall and Society, political organization of New York, purporting to represent the Democratic party. The source of its power is to be found in its literal acceptance of the maxim that 'to the victors belong the spoils.' Its supporters are (since 1850) recruited principally from the alien population in the city, especially the Irish. Mr. Bryce traces the history of the society in his *American Commonwealth* (1888). It was started, under the name of the Columbian Society, in 1789, by William Mooney, an Irish-American. The name was changed to the Tammany Society in 1805. By 1812 it had become a force in New York, and a quarter of a century later it had won its way to a predominant influence in city politics. Each of the 30 Assembly districts in the city annually elects a certain number of members, varying from 60 to 270, to sit on the general committee. The general committee elects a 'leader' for each district, and the 30 'leaders' form the executive committee. The organization is controlled by a 'boss,' who is practically autocratic. The first 'boss' was William Marcy Tweed, who in 1868, by frauds of unprecedented magnitude, got control of the chief offices in the state and the city, and became the virtual ruler of New York. The frauds were exposed in 1871, and Tweed was sentenced to twelve years' imprisonment. He was followed as 'boss' by Kelly, and he by Richard Croker. The proceedings before the Mazet Committee, which was appointed to inquire into the municipal corruptions of New York, showed that Tammany methods under Croker were what they were under Tweed. Croker was succeeded by one Murphy. All, or nearly all, the money gained by Tammany represented blackmail levied on corporations and wealthy men, 'who find that the city authorities have so many opportunities of interfering vexatiously with their business, that they prefer to buy them off and live in peace.' Tammany's nominee for the mayoralty was defeated in 1894, but was triumphant again in 1897. Tammany was overthrown in 1901, but two years later its candidate for the mayoralty had a majority of nearly 64,000 votes.

Tammerfors, tn. in Tavastehus gov., Finland, 100 m. N.N.W.

of Helsingfors; has paper, cotton, linen, and woollen mills. Pop. (1902) 38,739.

Tammuz, the sun-god, husband of Ishtar, both alike worshipped by the Akkadians, Babylonians, Assyrians, and Phœnicians. Called Adoni ('lord'), Tammuz became the Adonis of the Greeks. At the festival of his winter decline female devotees abandoned themselves to licentious frenzy. Tammuz and his worship are the subject of a well-known passage in *Paradise Lost*.

Tamp, to plug up with earth or clay the mouth of a hole drilled in rock, the rest of the hole being filled with powder preparatory to blasting.

Tampa, city, seapt., and winter resort, Florida, U.S.A., co. seat of Hillsboro co., on W. coast, at the head of Tampa Bay. It manufactures cigars. Pop. (1900) 15,839.

Tampico, seapt. tn., Mexico, on Gulf of Mexico, 210 m. N.N.E. of Mexico city; is a rival to Vera Cruz. Pop. 16,300.

Tamsui, treaty port on N. coast of Formosa, Japan; exports tea, rice, sugar, camphor, and coal. It was bombarded by the French in 1884. Pop. 6,000.

Tamus. See BRYON.

Tamworth, munic. bor. and mrkt. tn., Staffordshire and Warwickshire, England, on Tame, 13 m. N.E. of Birmingham; has manufactures of elastic webbing, tape, paper, and small wares. Market-gardening is carried on; coal and fire-clay are mined. Among the buildings are the restored church of St. Editha and the castle. Tamworth was the residence of the kings of Mercia. Pop. (1901) 7,271.

Tamworth, tnshp., co. Inglis, N.S.W., Australia, 282 m. N. of Sydney, is divided by Peel R., and has gold and diamond fields. Pop. (1901) 5,802.

Tan, or TANNER'S Ooze, is the spent bark of oak, larch, and other trees, from which the tannin has been largely removed in the process of tanning leather. It is used in gardening as a manure and as a fermenting material in the making of hot-beds. It decays very slowly, and should not be employed alone if much heat is required. As a manure its value is more mechanical than chemical.

Tana, riv., Norway, formed by the junction of the Anarjokka or Enara and the Karasjokka. It forms the boundary between Finnmark and Russian Finland. Length, 250 m.

Tanagers (Tanagridæ), a family of American passerine birds, closely allied to the finches. Tanagers are usually beautifully coloured, the female being duller in tint than her mate. The diet

consists largely of insects and fruits. The song is sweet, and the birds are bold and lively, and generally finchlike in habits. The scarlet tanager, or red-bird (*Pyrranga rubra*), winters in tropical America, and is found in the United States in spring and summer. The male is bright scarlet, with black wings and tail.

Tanagra, a city of Boeotia in ancient Greece, on the l. bk. of the Asopus, not far from the Attic frontier. In history it is famous chiefly for a victory obtained near it in 457 B.C., by the Spartans over the Athenians. It belonged to the Boeotian League, and shared the fortunes of Thebes. The site was begun to be exca-

The exports comprise sesame, oil, seed, millet, Indian corn, timber, cowry shells, ivory, india-rubber, copra, hippopotamus teeth, and rhinoceros horns. Pop. 101,538.

Tananarivo, or ANTANANARIVO, chief town of Madagascar, and for a century past the Hova capital. It stands on a rocky ridge, from 500 to 600 ft. above the adjacent valleys. In the city and suburbs are thirty-five churches, twenty-seven of which are connected with the London Missionary Society. Carriage roads run to Tamatave, 190 m., and Majunga, 320 m. Pop. 55,000.

Tancred (1078-1112), a chief of the first crusade, was a son of

Hamburg he was handed over to the British government. In 1801 he was tried, and was sentenced to death, but was unconditionally set at liberty. See Madden's *United Irishmen* (1846).

Tanga, tn., German E. Africa, on Indian Ocean, 80 m. N. of Zanzibar, starting-point for railway to Usambara. It exports gum-copal and rubber. Pop. 5,000.

Tangail, tn., Maimansingh dist., Bengal, India, 50 m. N.W. of Dacca. Pop. (1901) 32,147.

Tanganyika, a lake in equatorial Africa, s.w. of Victoria Nyanza, over 400 m. long by 30 to 45 m. broad. The shores belong politically, the eastern to Germany, the southern to Brit-



Tangier from the Sea.

vated in 1874; the ancient walls, towers, and gates can be recognized; also the theatre. Numbers of Tanagra figurines in painted terra cotta were found in the necropolis. These graceful little statues, representing goddesses, muses, nymphs, cupids, and ordinary women, throw much light on the costumes of the period, and give high testimony to the good taste of their possessors.

Tanais, the ancient Greek name of the Russian river Don.

Tanaland, prov. of British E. Africa, bounded on E. by Indian Ocean. It comprises the districts of Tana R., Lamu, and Port Durnford, together with the sultanate of Witu. Total area, 34,000 sq. m.

Otho the Good. He fought at Nicæa, Antioch, and Jerusalem, and was awarded the principality of Tiberias. He was also granted the principality of Edessa. Tasso makes him the hero of his celebrated epic.

Tanda, munic. tn., Faizabad dist., Oudh, India, 86 m. N.W. of Benares; noted for 'Jamdani' muslin. Pop. (1901) 20,127.

Tandy, JAMES NAPPER (1740-1803), United Irishman, was born in Dublin, and became first secretary to the Dublin United Irishmen. On account of a pamphlet distributed against the Beresfords in 1793, he fled to America, then to France, and took part in the invasion of Ireland. At

ain, and the western to the Congo Free State. The lake, 2,700 ft. high, is enclosed by steep mountain chains rising to 7,000 ft. The only outlet is the Lukuja, which, flowing out on the W. side at 6° S., makes its way to the Congo. Swimming islands occasionally cover large areas.

Tangent, a line which cuts a curve in coincident points. See TRIGONOMETRY.

Tanghinin, a poison acting on the heart, is obtained from the almonds of *Tanghinia venenifera*. It is stated to be the agent used for trial by ordeal in Madagascar.

Tangier, or TANGIERS (Lat. *Tingis*), fort. seapt. and a health

resort, Morocco, on Strait of Gibraltar, 35 m. s.w. of Gibraltar; is a chief commercial city of Morocco, and the diplomatic headquarters. Here are a great mosque, a castle, the sultan's palace, and the governor's residence. The chief exports are oxen, eggs, slippers, goatskins, and woollens. In 1905 the imports (chiefly cotton goods, flour, and hardware) were £567,590; exports, £295,763. It was ceded to England in 1662 as part of the dowry of Catherine of Braganza, wife of Charles II.; but in 1684 it was given up to Morocco. Pop. 30,000.

Tangle-seaweed, a name commonly applied, especially in Scotland, to an edible seaweed, *Laminaria digitata*. The name is also applied to another species of seaweed, *L. saccharina*.

Tanguts, a people of Tibetan stock, inhabiting great part of Kan-su province in China and the Koko-nor and Kham districts of Tibet. They are pastoral nomads, and pay tribute to China.

Tanis, or ZOAN, anc. Egyptian city in Nile delta, 32 m. w.s.w. of Port Said; was probably the capital of the Hyksos kings (15th and 16th dynasties), and capital of Egypt during the 19th dynasty. Prior to the siting up of the Tanitic Nile, Tanis was the chief commercial city of Egypt. It was founded seven years after Hebron, and is believed to have been the city of Rameses. The explorations of Flinders Petrie (1883-4) have brought to light much of its history.

Tanistry, a species of tenure in Irish law, founded on immemorial usage, according to which the actual holder of lands, etc., had but a life estate in them. The regulation of the succession belonged to the family.

Tanjore, munic. tn., cap. of Tanjore dist., Madras Presidency, India, 31 m. s.e. of Trichinopoly. It became British in 1799. It has a Hindu temple, a dismantled fort, and a palace, and is noted for its silks, carpets, jewels, and inlaid metal work. Pop. (1901) 57,870. The district comprises the delta of the Cauvery R., and has an area of 3,654 sq. m.

Tannahill, ROBERT (1774-1810), Scottish song-writer, was born at Paisley, where he became a handloom weaver. Consumptive and disappointed, he lost strength and heart, and ultimately committed suicide. Tannahill's songs—*Gloomy Winter's noo awa*, *Cruikston Castle*, *Jessie the Flower o' Dunblane*—have excellent quality. Edition of his *Works*, with memoir, by David Semple (1875).

Tanner, THOMAS (1674-1735), English antiquary, was born at Market Lavington in Wiltshire, and became fellow of All Souls,

Oxford (1696). In 1710 he became archdeacon of Norwich, in 1723 canon of Christ Church, Oxford, and in 1732 bishop of St. Asaph's. His *Notitia Monastica* appeared in 1695, and his *Bibliotheca Britannico-Hibernica*, a gigantic biographical dictionary, in 1748. He also edited (1721) Anthony à Wood's *Athenæ Oxonienses*.

Tannhäuser, a legendary knight, who, after being enticed into Venusberg, or the abode of earthly love, at length repented, and set off on a pilgrimage to Rome to confess his sins to Pope Urban IV. Absolution, however, the pope refused; so Tannhäuser returned to Frau Venus. The 'faithful Eckart' is said to sit in front of Venusberg and warn visitors away. The Venusberg is localized as Hørselberg, near Eisenach, seat of the old German goddess Hulda (modern German, Hölle). The legend has been used in Wagner's opera, which identifies Tannhäuser with Heinrich von Ofterdingen. The historic Tannhäuser was a Minnesinger of the 13th century, and attached himself to the courts of Frederick the Combative (1230-46) and Otto II. of Bavaria. His poems of love are characterized by sprightly vitality. See J. Nover's *Tannhäuser Sage* (1897); Ohlke's *Zu Tannhäusers Leben und Dichten* (1890); Grässe's *Sage von Ritter Tannhäuser* (1846).

Tannic Acid, or TANNIN, is the name given to a number of astringent substances of somewhat diverse constitution that are found in many plants, being produced there naturally or as the result of injuries inflicted by insects. In general, they are glucosides of gallic acid; though in some cases the glucose is probably only present as an impurity, whilst in others it is replaced by phloroglucol. Gallo-tannic acid, the tannin of oak galls, is extracted by an aqueous mixture of ether and alcohol, the tannin passing into the lower watery layer, from which it is separated by evaporation. The product consists largely of digallic acid, an anhydride of gallic acid, into which it is converted by boiling with dilute acids or alkalis. It is a colourless amorphous mass, soluble in water, and possessing a sharp astringent taste. It is acid to litmus, gives a blue-black colour with ferric chloride, precipitates gelatin, and yields pyrogallol on sublimation. It requires to be mixed with other tannins to produce a satisfactory leather, and is mostly employed in the preparation of ink and as a mordant in calico-printing. The natural tannins—such as those in oak bark, hemlock bark, divi-divi, valonia, sumach, gambier—are of very similar nature to the tannin

of galls, and are the chief tanning agents. Similar bodies occur in tea, hops, mountain-ash berries, having greater or less astringent properties. In medicine tannin is employed in the treatment of eruptions, hæmorrhage, diarrhoea, and, in short, when it is desired to coagulate an albuminous or mucous discharge; though internally it is apt to cause indigestion.

Tanning. See LEATHER.

Tansa, riv. valley, 60 m. N.E. of Bombay, transformed by a gigantic dam into a reservoir for supplying Bombay with water.

Tansillo, LUIGI (1510-68), Italian poet, was born at Venosa; spent several years at the court of the viceroy of Naples; and subsequently became a judge at Gaeta. His lyrics were edited by Fiorentino (1882). The *Capitoli Giocosi e Storici* (ed. by Volpicella, 1870) follow the manner partly of Ariosto's satires, and partly of Berni's burlesques. Among the *Poemetti* (ed. by Flaminio, 1893) the *Balia* is specially admired; a good English version was published in 1798 and in 1800. The youthful and erotic *Vendemmiatore* was put on the index by Paul IV. Tansillo's religious poem *Lagrima di S. Pietro* was not a great success (best ed. 1606).

Tansy, or TANACETUM, a genus of mostly hardy herbaceous plants belonging to the order Compositæ. They bear usually small, corymbose, yellow flower-heads, and are all of the easiest culture. *T. balsamita* is the costmary or alecost. The most desirable species, from a decorative point of view, is the silvery-leaved *T. leucophyllum*, from Turkestan. But much the most interesting is the native British tansy or buttons (*T. vulgare*), whose feathery leaves and yellow flower-heads are conspicuous in autumn. Its refreshing fragrance has long been recognized. Tansy was once extensively used as a flavouring herb.

Tantah, tn., in delta of Egypt, 76 m. s.e. of Alexandria, cap. of prov. Gharbiyeh, is noted for its fairs. Pop. (1897) 57,289.

Tantallon Castle, ruined Douglas stronghold, on N. coast of Haddingtonshire, Scotland, 3 m. E. of N. Berwick, fronting the Bass Rock. In 1639 the Covenanters took it from the Marquis of Douglas, and in 1659 it was further destroyed by General Monck. See Scott's *Marmion*.

Tantalum, Ta, 183, is a rare metallic element, occurring principally in the mineral tantalite, ferrous tantalate, FeTa₂O₆. It has been recently prepared by the reduction of potassium fluoro-tantalate, K₂TaF₇, by hydrogen, followed by fusion in a vacuum,

and is a white metal of specific gravity 16.8, that can be drawn into wire of great tenacity and very high fusing-point (225° C.). This wire has been used for the construction of the filaments of incandescent electric lamps. The chief compounds of tantalum are its acidic oxide, Ta_2O_5 , and its compound with potassium and fluorine, K_2TaF_7 . See *Electrical Review*, vol. lvi. (1905), p. 157.

Tantalus, in Greek mythology, a son of Zeus, and father of Pelops, Broteas, and Niobe. Tradition places his kingdom in Lydia, in Phrygia, at Argos, or at Corinth. He was punished in Hades, standing in the midst of a lake, whose waters ever receded when he tried to drink, while fruit-laden trees, hanging over his head, withdrew their branches if he tried to pluck their fruit; in addition, a huge rock, threatening to crush him, was suspended over his head. From his name and fate the English word 'tantalize' is derived.

Tantalus, or WOOD-IBIS, a genus of birds of the stork family, which connects the storks with the true ibises. Their habits are storklike, but the birds are more gregarious, and build smaller nests. In the warmer parts of America is found *Tantalus loculator*, the American wood-ibis, a white bird with greenish-black wings and tail, the head and upper part of the neck being naked and dark coloured.

Tantras, the sacred books of the Sakta sect of Hindus. Tantrik words are full of doubtful symbolism—for the most part impure—and mysterious and nonsensical rites and utterances for the invocation and expulsion of evil spirits. Their acceptance as sacred literature marks the influence of demonology on Hinduism. The *Panchatantra* is a celebrated Sanskrit book of fables, from which have come many of the fables known throughout Europe as those of Pilpay or Bidpai.

Tantum Ergo. See PANGE LINGUA.

Täoism. See LAO-TSE.

Taormina (anc. *Tauromenium*), tn., prov. Messina, E. coast Sicily, Italy, 30 m. by rail S.W. of Messina; was founded about 396 B.C., and has the ruins of a Greek theatre. Pop. (1901) 4,110.

Tap, an instrument used in engineering workshops for cutting a female screw in a drilled hole. It consists of a male screw of hard steel with a square head, which is gripped and turned by a wrench.

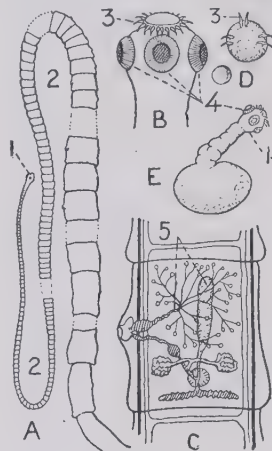
Tapajos. See AMAZONS.

Tapistry has been defined as 'painting by the weaving of coloured threads, intertwined on lines stretched vertically (*haute lisse* = high warp) or horizontally (*basse*

lisse = low warp), which become one substance or web combining lines and tones.' The skilled 'tapisserie,' himself an artist, interprets and embodies designs, called cartoons, the very soul of the work. Much is left to his taste and workmanship, and servile copying is fatal to success. The low-warp loom is one-third quicker than the high-warp, which produces the most perfect cloths. A Gobelin (high-warp) workman turns out on an average rather less than a square yard in three hundred working days, which costs the state, for wages only, from 2,000 to 2,100 francs. The greatest technical difficulty is to avoid mosaic work in passing from tone to tone and from light to shade; and this is done by 'hatching,' or graduating the tints, now over fourteen thousand in number, though in the best age of tapestry (1450-1550) there were but from twenty to sixty. 'Painted tapestry from Egypt' figures in Proverbs. Penelope's web, the warp vertical with weighted ends, is seen on the vase of Chiusi (400 B.C.). Tapestry terms are found in Homer (*Il.* iii. 125), Herodotus, and Euripides. In Ovid the loose ends of the warp are attached as at present, and the flowered border of the 15th century (*verdures*) anticipated. From Egypt the art was reintroduced into W. Europe by the Saracens and made at St. Florent (Saumur Abbey) in 985. It continued to flourish in France till the Hundred Years' war, when it passed to Flanders, and became known as arras till Spanish persecution drove it back again to France, to thrive in the manufactures of Gobelins (1667), the Savonnerie, Beauvais, and Aubusson. The first two were united (1826) and placed under state control (1864). William Sheldon wove maps of Yorkshire at Burcheston (Warwick) in 1570. A factory, established by James I. at Mortlake, under Sir Francis Crane, existed from 1619-88 at least. A low-warp loom existed at Windsor (1872-80), followed by the present high-warp looms at Merton Abbey, Surrey, established (1880) by William Morris, for whom Sir Edward Burne-Jones supplied cartoons for *The Star of Bethlehem* and *The Legend of Arthur*. *The Acts of the Apostles*, woven (1515-19) for Leo X. for the Sistine chapel, cost £200 for each of the ten cartoons to Raphael, and £30,000 to the manufacturer. See, for magnificent reproductions, *Samplers and Stitching of the Same*, by Huish and Head (1900); *La Collection Spitzer* (1890); also *History of Tapestry* (1885); *Les Tapisseries* (1890); *Les Tapisseries de Raphael* (1897); *La Tapisserie dans l'Antiquité*

(1878), by E. Müntz; *L'Art Copte*, by Gayet (1902); *La Tapisserie*, by Havard (1893); *Répertoire des Gobelins* (1893).

Tapeworms, or CESTODA, a class of flatworms, which includes some important parasites. A tapeworm consists of a head or scolex, furnished with suckers and hooks, and a chain of proglottides. The head is embedded in the intestinal wall of the host, and the chain of proglottides floats freely in the lumen of the intestine. Each proglottis contains a complete set of reproductive organs, male and female, and the ova of each are self-fertilized. Ultimately the proglottis becomes a mere bag of eggs, each of which is invested in a firm shell. Such ripe proglottides break off from the chain,



Tapeworm.

A. Tapeworm (*Tenia solium*). B. Head. C. A. proglottis. D. Egg. E. Bladder-worm stage. 1, head; 2, proglottides from various sections of body; 3, hooks; 4, suckers; 5, reproductive organs.

and pass out with the faeces of the host. The formation of fresh proglottides is continually taking place in the anterior region of the worm to replace those which are being lost. Some of the simpler forms are very small, while the *Tenia solium* of man may reach a length of nine feet. *T. echinococcus* is specially interesting because its larval stages occur in man, and are known as hydrated cysts. The life-history of tapeworms is discussed in the article BLADDER-WORMS. The most frequent tapeworms of man are *Tenia solium*, whose bladder-worm stage is found in the pig; and *T. saginata*, whose bladder-worm is found in the ox. Tapeworm is only likely to be acquired where meat is habitually eaten raw, or in an imperfectly cooked state. See PARASITES.

Tapioca. See CASSAVA.

Tapir (*Tapirus*), a genus of perissodactyle ungulates. In all the species the cheek teeth are short-crowned, and bear two simple ridges, while there are four



Tapir.

toes on the fore limb and three on the hind. The body is bulky and clumsy, the legs are short, the nose and upper lip are prolonged into a short and flexible proboscis, bearing the nostrils at its extremity; the ears are not large, and are ovate and erect, the tail is short, and the thick skin is scantily covered with hair. The animals are always found in forest regions, in the vicinity of water, are nocturnal in habit, and shy and inoffensive. The food consists of buds, leaves, and shoots. Except in the Malayan tapir (*T. indicus*), the adults are uniformly dark brown, but the young forms are marked with spots and stripes of pale colour on a darker ground. Four species occur in America, the best known being *T. americanus*, the common tapir of Brazil and Paraguay; another species (*T. Roulini*) is found in the high Andes, while the remaining two occur in Central America. The American tapirs are hunted both for their skin and their flesh. The tapirs afford an example of a primitive type of perissodactyle structure, as compared, for example, with the highly specialized horse. The evidence goes to show that they originated in Europe, whence they spread to America and S. Asia.

Tapet, in engineering, a pin projecting from a moving shaft, which strikes or taps some moving piece at regular intervals. The valves of some slow-moving engines, such as beam engines, are worked in this way.

Tapping, in surgery, the operation resorted to for giving vent to fluid which has collected in some space, as that of the pleura or peritoneum. It is usually performed by introducing one end of a small tube into the cavity and withdrawing the fluid by suction.

Taprobane. See CEYLON.

Tapti, riv., W. India, rises in Central Provinces, flows W., and falls into the Gulf of Cambay. Length, 450 m. Drainage area, 26,163 sq. m.

Tar is the complex mixture of hydrocarbons and hydrocarbon derivatives, obtained when wood, shale, or coal is destructively distilled. It is in general a black or very dark brown viscous liquid, with a distinctive smell. The principal kind of tar is described under COAL TAR. The wood tar collected in cavities below the 'meilers,' or heaps in which charcoal is burned, is known as Archangel or Stockholm tar, and is very thick, with a strong empyreumatic odour. It is acid, from the presence of acetic acid, and contains paraffins, resins, and particularly the higher phenols and aromatic ethers. Retort wood tar is thinner, and contains a greater proportion of paraffins. Wood tar is distilled to obtain creosote. Paraffin and pitch are also produced. Wood tar is used for preserving wood, rope, and felt, in the preparation of an ointment for skin diseases, and is used internally for bronchitis. Shale tar is of dark greenish

capital and palace of the early Irish kings, and a noted seat of learning.

Tara Fern, the name given to the common bracken in New Zealand, where the rootstock used to form a staple article of food.

Tarai, a dist. in the Kumaun division of the United Provinces, India, having an area of 938 sq. m. It consists of a narrow strip of country, running for about 90 m. east and west along the base of the Himalayas, and covered with dense jungle and pestilential swamps—the haunt of elephants, tigers, bears, and wolves. Chief town, Kasipur.

Taranaki, prov. dist. of New Zealand, on W. coast of North Island, with an area of 3,810 sq. m. and a seaboard of 130 m. It is the chief dairying district, butter and cheese being its principal products. Mt. Egmont dominates the district. New Plymouth is practically its only port. Pop. (1901) 37,842.



Southern Crater of Mount Tarawera.

(Photo by the New Zealand Government Tourist Department.)

colour, is alkaline, and chiefly consists of paraffins. Its separation into paraffin oils and wax is described under PARAFFIN. Blast-furnace tar is intermediate in property between coal tar and shale tar, yielding anilines, phenols, hydrocarbon oils, and some paraffin wax. The oils obtained are, however, of little value for burning or lubrication. Coke-oven tar varies, according to the temperature of the process and kind of coal used, from a product resembling blast-furnace tar to one very similar to and as valuable as coal tar.

Tara. See TARO.

Tara, hill, Co. Meath, Ireland, 6 m. S.E. of Navan; site of the

Tarantism, or TARANTULISM, an epidemic dancing mania which prevailed in Italy during the 16th and 17th centuries, and which originated in exaggerated dread of the tarantula, a venomous spider, whose bite was supposed to cause spasmodic movements of the limbs. By many the dancing was believed to counteract the effects of a bite. Others considered that dancing dispelled the deadly depression which was supposed to follow the tarantula's bite. Hysteria and psychical and moral perversions resulted from the strange mania, which sometimes terminated in suicide. Tarantulism gradually died out in the beginning of the 18th century.

Taranto (anc. *Tarentum*), fort. seapt. in prov. Lecce, S. Italy, at N. end of Gulf of Taranto. It has a naval arsenal and two harbours. Oyster and mussel fisheries are the chief industries, with manufacture of barrels, soap, oil, velvets, and cottons. The cathedral and the episcopal palace are among the principal buildings. The ancient citadel has been demolished. Pop. (1901) 60,331. See also TARENTUM.

Tarantula. See SPIDER and TARANTISM.

Tarapaca, maritime prov. of N. Chile, s. of Taena; covers an area of 18,125 sq. m., and has large deposits of nitrate of soda; copper, nickel, and gold are mined. The capital is Iquique. The province was taken from Peru in 1879, and ceded to Chile in 1884. Pop. (1900) 98,769.

Tarare, tn. in dep. Rhône, France, at base of Mt. Tarare, 20 m. W.N.W. of Lyons; is a centre of muslin manufacture; velvets and silk plush are also made. Pop. (1901) 12,203.

Tarasans, one of the semi-civilized nations of Mexico, were in alliance with the Aztecs; but the Tarascan language is radically distinct from Aztec. The Tarasans had a knowledge of pictorial writing, and surpassed the surrounding nations in several of the industrial arts, as well as in their social and political institutions.

Tarascon (anc. *Tarasco*), tn. in dep. Bouches-du-Rhône, France, on l. bk. of Rhone, 10 m. N. of Arles; has silk-spinning and hat manufactures. The church of St. Martha dates from the 12th century. See Daudet's *Tartarin de Tarascon*. Pop. (1901) 8,511.

Tarashcha, tn., Kiev gov., S.W. Russia, 53 m. s. of Kiev city. There are breweries. Pop. (1897) 11,452.

Tarasp, health resort and wat.-pl., canton of Grisons, Lower Engadine, Switzerland, on the Inn, 28 m. N.E. of St. Moritz. Pop. (1900) 278.

Tarawera, a cluster of mountains, sloping steeply to Lake Tarawera in Hot Lake District of North Island of New Zealand. It burst into eruption on June 10, 1886, covering 5,700 sq. m. with mud and ashes. Its height was raised 164 ft. (highest peak, 3,770 ft.).

Taraxacum, a genus of herbaceous plants belonging to the order Compositæ. The common dandelion is *T. officinalis*. A species sometimes seen in gardens is *T. montanum*, which flowers in August.

Tarazona, city and episcopal see, prov. Saragossa, Spain, 46 m. N.W. of Saragossa. It is an ancient Roman city (*Turiso*), and has an interesting Gothic cathedral. Pop. (1900) 8,790.

Tarbagatai, mt. range, running E. between Asiatic Russia and Zungaria for about 220 m. The highest summit is Muz-tau (11,920 ft.).

Tarbert, vil. and fishing station, Argyllshire, Scotland, 30 m. N.N.E. of Campbeltown; has the remains of an ancient castle built by King Robert the Bruce, who resided here in 1436. Pop. (1901) 1,697.

Tarbes, tn., cap. of dep. Hautes-Pyrénées, France, on l. bk. of Adour, 22 m. S.S.E. of Pau; has manufactures of coarse woollen goods, machinery and cannon, and paper. The district is noted for its fine horses. The cathedral dates from the 12th century. Pop. (1901) 26,055.

Tarbolton, tn., Ayrshire, Scotland, 8 m. N.E. of Ayr, Alexander Peden, 'the prophet,' was a schoolmaster here. Pop. (1901) 3,961.

Tardigrada, BEAR ANIMALCULES, or SLOTH ANIMALCULES, an obscure order of arachnids, including microscopic forms found in standing water. The animals, or in some instances the eggs only, are capable of being completely dried without injury.

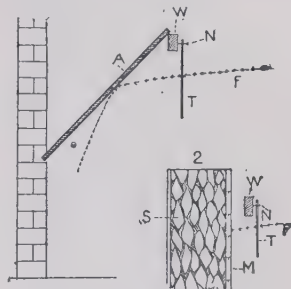
Tare and Tret, those deductions which have to be made from the gross weight of merchantable articles. The weight of the packing-case, etc., is the 'tare'; what remains after this has been subtracted from the package is called the 'net weight.' 'Tret' is the allowance made for dust, etc., and is deducted from the net weight at the rate of four pounds in every hundred and four—i.e. $\frac{1}{25}$ th of the net weight is allowed for extraneous accumulations.

Tarentum (Gr. *Taras*), anc. Greek colony in S. Italy, at the extreme N. point of the Gulf of Tarentum, was the only colony ever founded (707 B.C.) by Spartans. It became very prosperous, chiefly owing to its trade in woollen fabrics. It was taken by Rome in 272 B.C. In the Second Punic war it revolted in 212, and was recaptured in 207 and severely punished; thenceforward it was an ally of Rome, and afterwards a Roman colony. It lost its commercial prosperity, but retained its reputation for luxury. See TARANTO.

Tares, a popular name for several species of vetch, especially for the common vetch (*Vicia sativa*), which is cultivated as a fodder plant for horses and cattle. The 'tares' referred to in Matt. 13 are thought to be the darnel (*Lolium temulentum*).

Target, a mark of circular or other shape to shoot at. In archery it consists of straw bales, with painted canvas faces sewed on them. The 'national' targets

are 4 ft. diameter, faced with five circles—the centre gold, and scoring 9; then red, 7; blue, 5; black, 3; and white, 1. In the case of rifle targets, those for light-gun practice are made of wood, 6 ft. either way and $\frac{1}{2}$ in. thick. For small-arm practice targets are fashioned of cast iron, 6 ft. by 2 ft., with circular bull's-eyes and centres. The plate, seven-eighths of an inch thick, is bulged up in the centre to one inch in thickness. For heavy guns firing seawards the targets are floating.



Targets for Miniature Rifle Ranges—Bullet-stopping devices.

1. Iron plate, A, $\frac{1}{2}$ in. thick, to deflect the bullet. 2. Safety-backing of stone chips, A, behind matchboarding, M. T. Target suspended from wooden slip, W, by nail, N. F. Path of bullet.

Targoviste, or TIRGOVISHTÉ, chief tn. of Dambovitza co., Walachia, Roumania, at foot of Carpathians, 47 m. N.W. of Bucharest; has ancient and beautiful cathedral, ruins of old palace, and an arsenal. From 1383 to 1716 Targoviste was the capital of Walachia. Pop. (1889) 8,299.

Targum, the Aramaic translation, or rather paraphrase, of the Old Testament. When Hebrew, in post-exilic times, had become largely disused, translations into the current Aramaic (Eastern Aramaic, or Chaldaic) became necessary. These versions were committed to writing (by 1st century A.D.), but those now extant are probably revisions dating from the 4th or 5th century A.D. These are:—(1.) On the Pentateuch—the Targum of Onkelos, or Babylonian Targum; the Jerusalem Targum II. (fragmentary); the Targum of Jonathan, or Jerusalem Targum I. (2.) On the Prophets—the Targum of Jonathan, or Babylonian Targum on the Prophets. (3.) On the Hagiographa (poetical and late historical books)—Targums on all except Ezra, Nehemiah, and Daniel.

Tarifa, city, prov. Cadiz, Spain, 10 m. S.W. of Algeiras, at extreme south point of the peninsula, on Strait of Gibraltar. There is an ancient castle, be-

sides a strong fortress on an adjacent island. It carries on tunny-fishing. Pop. (1900) 11,723.

Tariff, the schedule of duties charged on the importation of merchandise into a country. The history of tariffs has already been treated under CUSTOMS TARIFFS, and we shall deal in this article with some practical and theoretical distinctions. Originally the tariff was collected for revenue only. Ulterior objects, such as the protection and encouragement of English industry, were accomplished in other ways by direct taxes on foreign merchants, by changing the staple town, by actual prohibition, etc. It was not till after the restoration that the customs duties were utilized to benefit trade. The mercantile system developed into the system of protection. Of tariffs for protection the best instance is that of the United States. It is sometimes said that a protective tariff and a revenue tariff are incompatible. If protection is afforded, then importation is checked, and little revenue is collected; while, if revenue is collected in large amounts, there can be no adequate protection. But in view of the fact that many nations do manage to collect revenue from a protective tariff, this contention seems rather doctrinaire. It receives, however, support from the fact that when a tariff is analyzed it generally appears that the revenue collected on a very large number of articles is very small. This is due to the fact that consumption in any case is limited, and is probably not much affected by price. A committee of the House of Commons reported in 1840 that a group of 349 articles—more than a third of the total number taxed—produced £8,050 in the aggregate, and a second group of 132 produced £31,629, while 9 articles produced £18,575,071. From the point of view of revenue the first two groups were worthless; but the object of these duties was protective, and that may or may not have been attained. In the case of the nine articles it by no means followed that because they produced revenue they were not protective. Protection does not mean prohibition, but, in theory at least, an equalizing of disadvantages.

It is not always realized that a tariff is an artificial barrier erected against trade; otherwise nations would not be so foolish and inconsistent as to spend money lavishly with one hand to remove natural obstacles to trade, while raising tariff barriers to exclude the trade which the removal of natural obstacles creates. The South German demand for protection against Italian

produce after the opening of the St. Gothard tunnel is a case in point. Canada also, for instance, has spent much money in subsidizing steamship lines to encourage her export trade; but it has been forgotten that steamships must carry freight both ways in order to pay, so that the steamship subsidy was actually the removal of part of the protection which the tariff afforded. With regard to tariffs, it is argued that it is well to have a high tariff, because you can always negotiate with other nations by means of it, a nation with a low tariff being unable to retaliate. This is based on the idea that the burden of tariff falls on the foreign producer and not on the home consumer; which means in the end that each nation bears part of the burden of the taxation of all other nations, and none of its own.

Tariff Reform. The tariff-reform movement had three main sources—*viz.* (1) an increasing pressure upon the home and foreign trade of the United Kingdom arising from the industrial development of competing foreign nations; (2) the strain upon the existing fiscal system caused by the growing national expenditure; and (3) the desire of the colonies, persistently expressed from the time of the Ottawa Conference of 1894 onwards, for mutual trading preference among the self-governing states of the empire. Among the 1902 Budget expedients for broadening the basis of taxation and raising money to meet the Boer war expenditure, Sir Michael Hicks Beach, as chancellor of the Exchequer in the Balfour ministry, imposed a registration duty on corn amounting to 1s. per quarter, or 3d. per cwt., on grain, and 5d. per cwt. on flour. At the Colonial Conference of 1902 the colonial prime ministers affirmed the principle of preferential trade, declared in favour of substantial preference to British goods in colonial tariffs, and urged the British government to grant 'preferential treatment to the products and manufactures of the colonies, either by exemption from or reduction of duties now or hereafter imposed.' Of her own accord Canada had in 1897 granted British dutiable goods a preference of 25 per cent., which she increased in 1900 to 33½ per cent.; and at the time of the Colonial Conference of 1902 Canadian ministers made 'a further definite offer.' In the words of Mr. Chamberlain they said: 'If you are willing to reciprocate in any way, we are prepared to reconsider our tariff with a view of seeing whether we cannot give you further reductions, especially with

regard to those goods in which you come into competition with foreigners; and we will do this if you will meet us by giving us a drawback on the small tax of 1s. per quarter which you have put on corn.' But the 1s. registration duty on corn was abolished in 1903, and the Canadian offer could not then be accepted.

Out of these circumstances grew the movement for tariff reform. It was prefaced by a speech at Birmingham, on May 15, 1903, in which Mr. Chamberlain, then colonial secretary, advocated a 'treaty of preference and reciprocity with our own children'—the colonies; it was formally inaugurated at Glasgow on Oct. 6, 1903, when, having resigned the colonial secretaryship in order to have a free hand in the movement, Mr. Chamberlain submitted 'the broad outlines' of his plan. These outlines were as follows:—

Proposed new Taxes.—Two shillings a quarter on foreign (not colonial) corn; corresponding tax on foreign flour; 5 per cent. on foreign meat; 5 per cent. on foreign dairy produce; an average of 10 per cent. on completely manufactured foreign goods. *Taxes to be relieved.*—Three-quarters of the tea duty to be taken off; half the sugar duty taken off; corresponding reduction on coffee and cocoa; preference to colonial wines and fruit. *Duties not contemplated.*—No tax on raw materials; no tax on maize; no tax on bacon. The Tariff Reform League was set on foot to carry out a general educational campaign, and in December 1903 Mr. Chamberlain called together a body of business men, under the name of the Tariff Commission, to examine his fiscal proposals and report as to:—(1) Their probable effect on present conditions; (2) whether any, and if so what, modifications are desirable, having due regard to the general interests of the community; (3) the best way in which, where there are conflicting interests, those interests can be harmonized; (4) what duties, if any, should be recommended. The report of the Tariff Commission must do much to define in detail the proposals to be ultimately put before the electorate and Parliament. Interim volumes of the commission report have been issued, dealing with the iron and steel, cotton, woollen, silk, lace, hosiery, and carpet industries; and when the conditions in all the leading industries and agriculture have been surveyed, a final report will deal with the proposed tariff as a whole. Upon the commission were placed six members of Parliament; Mr. Charles Booth, the author of *Life and Labour of the People in London*; Mr. Alfred Mosely, who

led and organized the educational and trades union commissions to the United States; four bankers; four shipowners; seven members possessing special knowledge of conditions in the various colonies and India; two members formerly leading permanent officials of the Board of Customs; also manufacturers and merchants concerned in the leading trades of the country. The consideration of proposals affecting agriculture was entrusted to a special committee of farmers and agricultural authorities, under the chairmanship of Mr. Henry Chaplin.

The main arguments upon which the case for tariff reforms may be stated are as follows:—(1.) Democratic countries such as the United States, autocratic countries such as Germany, and opportunist countries such as France—in fact, all progressive modern states except alone the United Kingdom—have found it necessary to their industrial progress to provide a national trade policy, each suited to the present needs of the country concerned. The United Kingdom, as the centre of the British empire, must also adopt a trade policy suited to the present needs of the empire, with the maintenance of which the Cobdenite system is no longer compatible. [To this the usual free-trade reply is that the United Kingdom is, on the whole, doing as well as can be expected.] (2.) In the absence of a trade policy adapted to the needs of the British empire, the home markets of the United Kingdom are being increasingly invaded by foreign manufacturers to the detriment of British industries and the loss of British labour. The imports of manufactures into the United Kingdom from Germany, Holland, and Belgium alone nearly doubled in the twenty years (1884-1904). [The free-trade contention is that these imports are, generally speaking, beneficial to the British consumer; they would not be imported if they did not meet a British need.] (3.) The markets of foreign protected countries, upon which the stability of many leading British industries has in the past largely depended, are being increasingly restricted for British manufactures as the result of high tariffs; while their surplus stocks are exported to our unprotected markets, and disposed of at a price to undersell the home manufactures—the so-called 'dumping.' British exports of manufactures per head of the population of the United Kingdom which were of the value of £6, 14s. in 1871-5 were £5, 16s. in 1881-5, £4, 19s. in 1891-5, and £5, 11s. in 1901-5. And the tendency is ever to increase the restric-

tions, as witness the 1906 tariffs of Germany, Austria-Hungary, Belgium, Switzerland, Serbia, and Roumania, all of which operate for twelve years. The most-favoured-nation clause, which was intended to give equality of treatment as between British and other foreign goods in protected markets, has failed of that purpose by reason, among other causes, of the minute classifications of continental tariffs, so that under the 1892 tariff only 2.6 per cent. of the export trade of the United Kingdom with Germany received any relief under the most-favoured-nation treatment. [The free-trade view is that high duties hurt the countries imposing them even more than they hurt other nations.] (4.) In the neutral markets, which are essential to the prosperity of the British cotton, woollen, iron and steel, and other staple industries, foreign manufacturers are competing successfully with British manufacturers; while the certain rapid development of home industries, upon an exceptionally cheap labour basis in Japan, China, and South American countries, is a further indication of the future insecurity of British trade in these non-protective tariff countries. [The free trade answer to this point is that British trade is still enormously preponderant in neutral markets, and will continue to enjoy exceptional advantages over outside competitors by reason of the lower cost of manufacture incident to the British policy of free imports.] (5.) Similarly, in British colonial markets the trade of the United States and Germany is progressing more rapidly than British trade. In the twenty years (1884-1904) the British share of the Canadian import trade fell from 40 to 25 per cent. of the whole; while the United States share rose from 47 to 60 per cent. of the whole. The adoption of the Canadian preference on British goods (1897) has been followed by a substantial and continuous increase in Canadian purchases of British manufactures, and the same upward tendencies are noticeable in other colonial markets where preference is granted; but it is still true that, in the absence of the enlarged and mutual preference for which the colonies have asked, the British share of colonial markets is increasing at a lesser rate than the share of the United States and other foreign countries, as regards both dutiable and free goods. Failing the adoption of a policy of mutual preference between the United Kingdom and the colonies, the colonies, and especially Canada, are under continued pressure to enter into reciprocal arrangements with

the United States, Germany, and other countries, which must in their nature prove a hindrance to British trade in its most promising future outlet, and must ultimately undermine the political unity of the empire. [The free-trade view is that the taxation of foreign produce in British markets for the benefit of colonial interest is economically and politically unwise, and would involve the risk of increased cost of food for the British working classes. Moreover, the administration of fiscal arrangements would develop friction between the United Kingdom and the colonies.] See *Imperial Union and Tariff Reform*, by the Right Hon. J. Chamberlain; *Economic Notes on Insular Free Trade and Speeches on Fiscal Reform*, by the Right Hon. A. J. Balfour; *Speeches*, by the Right Hon. H. H. Asquith; *The Tariff Problem*, by Professor W. J. Ashley; *National Progress in Wealth and Trade*, by A. L. Bowley; *Imperial Reciprocity*, by Sir Vincent Caillard.

Tarik. See GIBRALTAR.

Tarim, riv., E. Turkestan, Asia, rises as the Yarkand Daria in the glaciers of the Karakoram Mts. in the N. of Kashmir, flows N. through the Kuenlun Mts., then goes N.E. past Yarkand, skirts the N. edge of the Turkestan desert region, after receiving the Kashgar Daria from the N., the Khotan Daria from the S., and the Aksu from the N., and finally takes a S.E. turn towards the Lob Nor region, which it reaches after a course of some 1,000 m., much reduced in volume by evaporation. Sven Hedin, in his explorations in the Tarim basin in 1895, discovered the remains of two ancient cities buried in the westward-moving sand dunes; in 1899 he floated down the Tarim to the Lob Nor, and discovered near the N. bank traces of Chinese civilization of the 3rd century. See his *Scientific Results* (1905-6).

Tarlatan, a thin open transparent muslin, imported from India, but later on imitated in Europe. A chief centre of its manufacture is Tarare in France, dep. Rhône.

Tarlton, SIR BANNASTRE (1754-1833), British soldier, was born in Liverpool. He was present at the capture of New York, at the battles of White Plains and Brandywine, and the capture of Germantown. On his return to England after Cornwallis's surrender at Jamestown, he entered Parliament as member for Liverpool (1790), acting with the Whig opposition. He published an account of the American campaigns, reflecting severely on the conduct of Cornwallis.

Tarlton, RICHARD (d. 1588), English actor, born in Shropshire; was a favourite of Queen Eliza-

beth, a wit, and a comic actor. He was the contriver and arranger of *The Seven Deadly Sins*. See Halliwell - Phillips's *Tarlton's Jestes and Newes out of Purgatorie* (1844).

Tarn (part of anc. *Languedoc*), dep. of S. France, s. of Aveyron, covers an area of 2,231 sq. m. It is watered by the Tarn, Agout, and Aveyron, and traversed in the s. and s.e. by spurs of the Cevennes. Wheat is the chief crop, and the vine is largely cultivated. Coal, iron, and copper are mined. Coarse woollens, steel and iron goods, hosiery, silks, and glass are manufactured. Albi is the capital. Pop. (1901) 332,093.

Tarn-et-Garonne, dep. of S. France, watered by the Garonne and its tributaries, the Tarn and the Aveyron; covers an area of 1,440 sq. m. It is mainly plateau. Wheat and the vine are extensively cultivated. Fruit is largely grown. Coarse woollens, leather, silk, and beet-sugar are manufactured. Montauban is the capital. Pop. (1901) 195,669.

Tarnopol, tn., Galicia, Austria, on the Sereth, 75 m. E.S.E. of Lemberg; has brewing, spirit-refining, and corn-milling. Pop. (1900) 30,415.

Tarnow, tn., Galicia, Austria, 46 m. E. of Cracow; has manufactures of agricultural implements, and glass. Pop. (1900) 31,548.



Taro.

1, Gynoeceum, section; 2, androecium.

Taro, *TARA*, or *KALO*, a name sometimes given to certain herbs belonging to the genus *Colocasia*, a subdivision of the order *Aroidaceæ*. They are grown in the Pacific tropics for their large starchy roots, which are edible and nutritious. In Japan the tuber is eaten as we eat potatoes. The *poi* of Hawaii is made from the tuber of the taro (*kalo*).

Tarots. See CARDS.

Tarpan. See HORSE.

Tarpaulin, canvas rendered waterproof with a coating of tar, or any waterproof cloth used for protection against damp. Waxed paulin is sometimes substituted for tarpaulin.

Tarpeia, in ancient Roman legend, a daughter of the governor of the Capitol, who, when the Sabines were besieging the fortress, was bribed by their golden bracelets and collars to open one of the gates to them; but on entering they cast their shields on her, and she died. Her name was given to the Tarpeian rock, a cliff on the Capitol, over which malefactors were thrown.



Tarpon.

Tarpon (*Megalops atlanticus*), a fish related to the herring, which occurs off the south-eastern coasts of N. America and the W. Indies and southwards to Brazil, and is prized as food. It reaches a length of 6 ft. and a weight of over 100 lb. The most notable peculiarities are the large scales, which are more than two inches in diameter, and the curious prolongation of the last ray of the dorsal fin. Another species occurs in Indian waters.

Tarquinius, an ancient Etrurian city, on the w. coast of Italy, N.W. of Rome; was one of the league of twelve Etrurian cities, and was probably the head of the confederacy. Afterwards the city became a Roman colony; but about 800 A.D. its inhabitants founded a new town on an opposite hill—the modern Corneto.

Tarquins, *THE*, an ancient Roman family, two members of which were included among the early kings of Rome.—(1.) *LUCIUS TARQUINIUS PRISCUS* (616-578 B.C.), succeeded Ancus Martius. His reign was marked by victories over the Latins, Sabines, and Etruscans, and by the construction of the sewers, the Circus Maximus, the Forum, and the temple of Jupiter on the Capitol. Finally he was murdered at the instigation of the sons of Ancus Martius.—(2.) *LUCIUS TARQUINIUS SUPERBUS* (534-510 B.C.), the last king of Rome, oppressed both the people and nobles. Abroad he made Rome head of the Latin confederacy, conquered the Volscians and people of Gabii; but his son Sextus's rape of Lucretia roused the Romans, led by Brutus and Valerius, to expel the king and his family.

Tarragon, a perennial herbaceous plant, native of the coun-

tries bordering on the Mediterranean. It has long been cultivated as a flavouring herb, especially for vinegar. It is easily propagated by cuttings or root division in the spring.

Tarragona, Spanish port wine of a fruity, tawny type, produced in Catalonia, not far from Barcelona. The name is also applied to certain red Australian wines.

Tarragona. (1.) Prov., N.E. Spain, mountainous district on Mediterranean; fine climate. The slopes produce vast quantities of fruit, wine, grain, and oil, and the higher altitudes timber and cereals. There is prosperous industry in all sorts of fabrics. Area, 2,505 sq. m. Pop. (1900) 337,964. (2.) City, cap. of above province, 50 m. S.W. of Barcelona. Ancient Græco-Roman city, capital of Roman Eastern Spain (*Tarraco*). There are important remains—cyclopean walls, palace of Augustus, and a fine aqueduct. It is one of the best ports on the Mediterranean, with large exports of wine and fruit, and busy weaving industry. Pop. (1900) 23,423.

Tarrasa, city, prov. Barcelona, Spain, 15 m. N.W. of Barcelona; anciently Egara, of which many Roman remains exist. It is famous for its fine cloth, serges, tweeds, flannels. Pop. (1900) 15,956.

Tarrytown, vil., Westchester co., N. York, U.S.A., on Hudson R., 25 m. N. of New York; contains the 'Sleepy Hollow' of Washington Irving, whose grave is in the Dutch church graveyard. Pop. (1900) 4,770.

Tarshish, perhaps to be identified with the Phœnician town and district of Tartessus, round the mouth of the river Guadalquivir. It was an entrepôt for metals (silver) and marine products (fish). See Ezek. 27:12.

Tarsipes, a small Australian mammal about the size of a mouse, arboreal in habit, and feeding upon honey and insects. The tail is prehensile. The animal belongs to the same family as the phalangers.

Tarsus, the chief city in Cilicia in Asia Minor, on the river Cydnus, about 12 m. above its mouth. It was included in the Persian empire down to the time of Alexander's conquests (333 B.C.); afterwards it was an important city in the Syrian kingdom, and in 66 B.C. it was made the capital of the Roman province of Cilicia by Pompey. It was the birthplace of the apostle Paul.

Tartan, a woollen fabric of checkered pattern, and generally many coloured, worn in the Highlands of Scotland as kilt or plaid. Each clan wears a particularly coloured pattern as its distinctive

dress. In the Scottish Lowlands a black and white checkered plaid, known as the 'shepherd's tartan,' is worn.

Tartar, or more correctly TATAR, a term collectively applied by European writers to all the Mongolo-Turki peoples. The original Tartar tribe occupied the valleys of the In-shan range. In Europe the form Tartar, due to a confusion with the Tartarus of classic mythology, occurs in John de Piano Carpini. The Tartar (properly Turki) peoples range from the Lena basin (Yakutsk) through Siberia westwards to Central Russia (Kazan Tartars, Chuvashes), and through Central Asia (Turkomans, Uzbeks, Kipchaks, Kirghiz) south-west-

the Mongols are all either nominal Buddhists or Shamanists, the Tartars are exclusively Moham-medans. Sir H. H. Howorth's *History of the Mongols* (4 vols. 1876-88); W. Radloff's *Ethnographische Uebersicht der Türk. Stämme* (1883); H. Vambery's *Das Türkenvolk* (1885); K. Ikof's *La Craniologie des Tatars* (1891); A. H. Keane's *Man Past and Present* (1901).

Tartar Emetic, potassium antimonyl tartrate, $K(SbO)C_4H_4O_6 \frac{1}{2}H_2O$, is obtained by boiling antimony oxide with solution of cream of tartar. It forms rhombic efflorescent crystals, is fairly soluble in water, and has an unpleasant taste. In doses up to one-eighth of a grain it causes

posit obtained on the fermentation of wine, it is principally obtained. The preparation is carried out by crystallizing the tartar, which is then neutralized and precipitated as calcium tartrate, from which the tartaric acid is set free by dilute sulphuric acid, and purified by recrystallization. It occurs in large monoclinic crystals, which easily dissolve in water, and have a clean, sour taste. It is decomposed on heating, and behaves as a dibasic acid, the principal salts of which are the acid potassium tartrate, or cream of tartar; potassium sodium tartrate, or Rochelle salt; and tartar emetic. Its solution rotates polarized light to the right. Ordinary tar-



Tarsus in Cilicia, the birthplace of the Apostle Paul.

wards to Asia Minor, Caucasus, and the Balkan Peninsula (Ader-baijans, Alans, and Avars—i.e. the present Kabards, Nogai or Krim Tartars, Osmanli Turks, and many others). Ethnically they hold a somewhat intermediate position between the true Mongols and the Europeans, the types showing everywhere gradual transitions from the yellow, lank-haired, flat-featured, oblique-eyed, round-headed, undersized Tunguses, Kalmucks, Manchus, Gilyaks, of the Far East to the normal physical characters of the Western peoples. All speak dialects of the Turki tongue, which differs greatly from the Mongol branch of the common stock language; and while

profuse sweating, whilst in greater amounts it acts as an emetic. On account of its great irritant effect on the stomach and intestines, it acts as a violent poison if taken in greater than medicinal doses.

Tartaric Acid is dihydroxy-succinic acid, $CH(CH)COOH_2$, which, on account of its containing two asymmetric carbon atoms, exists in two stereo-isomeric forms—viz. dextro- or ordinary tartaric acid, levo-tartaric acid, meso- or inactive tartaric acid, and racemic acid, the latter being a mixture of the two first-named varieties. Ordinary tartaric acid occurs in many plants, particularly the grape; from the tartar or argol, which is the de-

taric acid is used in the preparation of effervescing mixtures and baking powder, and in dyeing.

Tartarus, in ancient Greek mythology, a son of Aether and Ge, and father of the giants. In Homer and later poets Tartarus is the place of torment for the wicked, as distinguished from Hades, the abode of the dead in general.

Tartini, GIUSEPPE (1692-1770), Italian violinist and musical composer, born at Pirano, near Trieste. He did not take up music as a profession until 1721, when he settled in Padua. He soon acquired a great reputation as a performer and teacher, and did more to develop the art of violin-playing than any other man of his

time. Perhaps his best known composition is his *Il Trillo del Diavolo*. He was the author of several important treatises on musical acoustics, and the discoverer of 'resultant tones.' See Helmholtz's *Sensations of Tone* (1863-70).

Tarudant, walled tn. and cap. of prov. of Sus, Morocco, 120 m. s.w. of Morocco; has manufactures of copper goods and leather. Pop. 8,500.

Tar Wood. See TAR.

Tasgaon, tn., Satara dist., Bombay Presidency, India, 74 m.

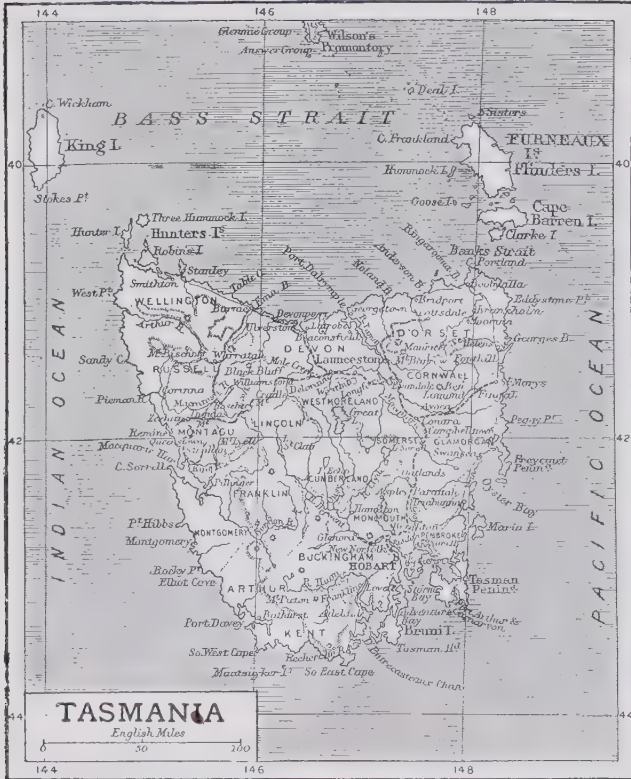
the native and the Russian, the latter to the s.e. of the former. Tashkend has an astronomical observatory. Silk, leather, and metal goods are manufactured. Pop. (1897) 156,414.

Tasma, the pseudonym of Jessie Couvreur, Australasian writer, born in London. Her father emigrated to Tasmania when she was quite young. She came to Europe (1879), and delivered lectures on Australian subjects for the Geographical Society of Paris (1880-2). In 1885 she married M. Auguste

Tasman Glacier, in the S. Alps of the South Island of New Zealand; area, 21 sq. m. Mount Cook and the highest mountains of the range tower above it. Sir Julius von Haast discovered it in 1862.

Tasmania, formerly Van Diemen's Land, is an island off the s. coast of Australia, from which it is separated by Bass Strait. The total area is 26,385 sq. m. The w. coast is bold, rocky, and inhospitable, but there are three accessible harbours—Port Davey, Pieman R., and Macquarie harbour. The other coasts of the island contain many safe bays and anchorages. Tasmania is covered by a network of ridges, termed locally tiers, which enclose a multitude of small plains and valleys. In two or three places an altitude of 5,000 ft. is reached. Volcanic action in various parts of the island is strongly marked. The island abounds in rivers, rivulets, and creeks, the principal being the Derwent, navigable to about twenty miles above Hobart, the capital; the Huon, about 100 m. in length, navigable, and running through a fertile, fruit-growing country; the Gordon, falling into Macquarie harbour; the Pieman R., farther up the w. coast; the Tamar, formed by the confluence of the North and South Esk at Launceston, is navigable for 40 m. for vessels drawing 16 ft. Brown trout are abundant in many of the rivers and lakes, and the salmon has been introduced. The lakes are numerous and extensive, the largest being the Great Lake, in the centre (area, 44 sq. m.).

The climate is fine and salubrious, the death rate being 12.55 per 1,000. The average temperature of January, the hottest month, is 63°, and of July, midwinter, 45°; mean for the year, 55° F. The rainfall is 18.45 in. Snow rarely falls, except in the mountains. All the grains, fruit, and vegetables which grow in Great Britain flourish. The native animals are for the most part of the same genera as those of the Australian mainland, with the addition of the native hyena, and the native devil. The forest trees include those found in Victoria, with the addition of the Huon and King William pines. The people are for the most part of British descent. The principal industries are agriculture, mining, and stock-raising, special attention being given to the raising of stud sheep for the Australian market. There are also smelting works, breweries, jam manufactories, flour mills, sawmills, soap and candle works, and cloth manufactories. The principal ports are Hobart (the



n.w. of Bijapur. Pop. (1901) 11,392.

Tashi Lama, or TESHU LAMA, formerly the second in dignity of the great Lamas. (See LAMAISM, LHASSA, and TIBET.) Since the British expedition of 1904, when the Dalai Lama fled from Lhassa, the Tashi Lama has become the recognized head of Lamaism in Tibet.

Tashkend, or TASHKENT, tn., cap. of Syr Daria prov., and of the general governorship of Russian Turkestan, 170 m. N.E. of Samarkand; is connected by rail with Orenburg. There are two cities,

Couvreur. Her best-known works include *Uncle Piper of Piper's Hill*, *In her Earliest Youth* (1889), and *A Sydney Sovereign*, a collection of short stories.

Tasman, ABEL JANSZON (1602-59), Dutch explorer, born at Hoorn; discovered the island of Tasmania in 1642, though until 1798 it was supposed to form part of Australia (or New Holland). Tasman also discovered New Zealand, which he named Staaten Land. He made a second expedition in 1644 for the purpose of charting the coasts of Australia.

cap.), Launceston, Strahan, Burnie (Emu Bay), Devonport (Mersey), Georgetown, Stanley, Swansea, and Ulverstone. The exports are wool, timber, gold, silver, tin, copper, jam, and fresh fruits, principally apples. Imports in 1904-5 were £2,554,454; exports, £2,989,600.

Tasmania is a state in the Commonwealth of Australia. It has a governor appointed by the crown, aided by a cabinet of five responsible ministers. The Roman Catholics have an archbishop and the Anglicans a bishop. Primary education is compulsory and non-sectarian. The defensive forces consist of about 4,500 volunteers and a small militia staff.

Tasmania was discovered on December 1, 1642, by the Dutch navigator Tasman. In 1798 Dr. Bass explored the island, discovered the strait which bears his name, and proved that Tasmania was an island. It was colonized in 1803 by Lieutenant Bowen and a party of soldiers and convicts. At the date of the first British occupation the natives numbered 5,000. The last pure-blooded Tasmanian died in 1876. Transportation ceased in 1853. In the same year representative institutions were introduced, and these were followed in 1856 by responsible government. Pop. (1901) 172,475—males, 89,624; females, 82,851. See West's *History of Tasmania* (1852), and Murray's *Tasmanian Rivers, Lakes, and Flowers* (1900).



Tasmanian Devil.

Tasmanian Devil (*Sarcophilus ursinus*), a strongly built nocturnal mammal, closely related to the thylacine, and like it confined to the island of Tasmania. The head is disproportionately large, and the plantigrade feet and general build give the animal a resemblance to a small bear. Carnivorous in habit, the Tasmanian devil will attack any kind of animal, and can easily overpower a sheep.

Tasman Sea, the name adopted in 1891 by the British admiralty for that part of the Pacific Ocean separating New Zealand and its N.W. outliers from Australia and Tasmania.

Tassie, JAMES (1735-99), Scottish gem-engraver, was born in Pollokshaws. He settled in London in 1766, and soon distinguished himself by the beauty

and finish of his reproductions of antique gems. In 1775 he published a *Catalogue of Impressions of Antique and Modern Gems*, and another in 1791. He also executed medallion portraits, chiefly from life; among his sitters were Dugald Stewart, Sir Henry Raeburn, Adam Smith, and David Hume. He was succeeded by his nephew, WILLIAM TASSIE (1777-1860), about 150 of whose medallions are now in the Scottish National Portrait Gallery, which also possesses J. Tassie's portrait by J. Paxton. See J. M. Gray's *James and William Tassie* (1894).

Tasso, BERNARDO (1493-1569), Italian poet, father of Torquato, was born at Venice, and spent his life in the service of Count Guido Rangone, Duchess Renata d'Este, Sanseverino, Prince of Salerno (whose secretary he became in 1532, and whose fortunes he shared), and Duke William of Mantua (1563). In 1560 appeared at Venice his huge romantic epic, *L'Amadigi*, a poor and bombastic imitation of Ariosto. His *Lettere* (ed. by Campori, 1869, with *Biography*, and by Portioli, 1871) is valuable for the history of the time.

Tasso, TORQUATO (1544-95), Italian poet, was born at Sorrento. In 1565 he proceeded to the court of Ferrara, and was at first attached to Count Luigi of Este (whom he accompanied to France in 1570), and then to Duke Alfonso II., with whom he went to Rome and Florence (1573-4). About this time Tasso first showed signs of that insanity, due to religious scruples and aesthetic sensitiveness, from which he was never entirely free. That his mental disturbance sprang from a hopeless passion for Leonora d'Este is now no longer maintained by any serious student. In 1576 he had to be put under restraint, and fled to Sorrento and to Piemonte, returning to Ferrara in 1579. He was next placed in the hospital of St. Anna, whence he was released at the intercession of the Gonzaga in 1586. The unhappy poet was now a wanderer from place to place—Mantua, Rome, and Naples—but found a final refuge with the Aldobrandini at Rome, where he died.

Tasso's lyrics, plays, dialogues, and letters are full of beauties; but the poet owes his immortality to two works alone—the epic *Gerusalemme Liberata* and the pastoral play *Aminta*. In 1562 he had published at Siena his youthful epic of *Rinaldo*, combining the classical traditions of antiquity with the romantic elements of the renaissance. On his masterpiece he was engaged between 1563 and 1575. The cen-

tral theme of the work is the first crusade under Godfrey of Bouillon. Tasso's models were Virgil and Ariosto, and the fusion of the classical and romantic elements is managed with far more skill than in *Rinaldo*. The style is on the whole dignified, though not free from certain affectations and exaggerations. A heated controversy sprang up around this great poem, both its manner and matter being subjected to severe criticism. The *Gerusalemme Conquistata*, which Tasso wrote to meet these views, is a complete failure. The plot of the *Aminta* (1573) is so simple and the poetry so exquisite that it excited rivalry, but no opposition.



Torquato Tasso.

The prose works were edited by Guasti (1853-75)—*Lettere* (1853-55); *Dialoghi* (1858-9); *Prose Diverse* (1875). See, too, Solerti's *Appendice*, (1892). Solerti published the *Opere Minori in Versi* (1891 and 1899); *Poemi Minori* (1891); *Teatro* (1895); *Rime* (1906). All the editions of the *Gerusalemme* were supplanted by that of Solerti and his co-operators (1895-6), and all the biographies by Solerti's monumental work (3 vols. 1895), which contains a bibliography. The *Gerusalemme* was translated by Fairfax (1600, often reprinted), Hoole, with Life (1743 and often); Doyne, with Life by Layng (1761); Hunt, with Life (1818); Wiffen (1821-25), Broadhead (1837), Smith (1851), Robertson (1853), Bent (1856), and James (1865). There are versions of the *Aminta* by Fraunce (1591), Leigh Hunt (1820), and Whitmore (1900). The *Rinaldo* was rendered by Hoole (1792), and the dialogue *Il Padre di Famiglia* by T. K. (1588). Other *Lives* in English are by Black (1810), Wilde (1848), Milman (1850), and Hasell (1882).

Tassoni, ALESSANDRO (1665-1635), Italian writer, was born at Modena, and in 1597 came to Rome. He spent much of his life in the service of various cardinals (Ascanio Colonna, Maurice of Savoy, and Ludovisi). Tassoni's chief title to fame is the mock-heroic poem *La Secchia Rapita* (written in 1614), dealing with an incident that occurred between Modena and Bologna; by reason of its unflagging spirit and humour, and of its style, it ranks with the *Lutrin* and *Rape of the Lock*. There is an English version by T. Atkinson (1825). The *Filippiche* (1615) are as passionate as the title implies, and form a valuable historical document. The *Considerazioni* on Petrarch (1609) mark an epoch in criticism, and forestall much that has been urged against that poet in recent times. See Monographs by Muratori (1744), Ronca (1884), Nunziante (1885), O. Bacci (1893), O. Guerrini (1895), and Rossi (1904). The last named also began editing the *Lettere* for the first time in 1901. See too T. C. Walker's *Memoirs of Alessandro Tassoni* (1815).

Taste. The taste organs are located chiefly in the tip and root of the tongue, in the lateral part of the soft palate, and in the glosso-palatine arch. Four distinct gustatory qualities are appreciated by the sense of taste—sweetness, bitterness, acidity, and salinity. The intensity of the sensation of taste varies with (1) the area of the surface stimulated, (2) the concentration of the stimulant, (3) the length of the period of application, and (4) the temperature of the substance tasted. The most favourable temperature is between 50° and 95° F. Taste is greatly aided by the sense of smell, with which it is often confounded. Many tactile impressions, such as harshness, coolness, and astringency, are erroneously attributed to taste. Derangements of taste may be due to hysteria, to alterations in the mucous membranes of the gustatory surfaces, and to lesions of nerve trunks, filaments, and end organs. Local measures may be adopted for affections of the mucous membrane; electrical stimulation of the lingual nerves sometimes restores the functions after paralysis.

Tata, JAMSETJEE NUSSER-WANJI (1839-1904), Bombay merchant and philanthropist, pioneer in the Indian cotton industry. He founded several scholarships, tenable by Indian youths at home and abroad, and gave £200,000 for the endowment of the Indian University of research at Bangalore.

Tatar = Bazardjik, tn., Bulgaria, div. E. Roumelia, on the

upper Maritza, 22 m. w. of Philippopolis. Pop. 16,000.

Tate, SIR HENRY (1819-99), presenter of the Tate collection and picture gallery to the British nation, was born at Chorley in Lancashire. He was a sugar refiner of Liverpool and Mincing Lane, London, and devoted his leisure to the fine arts.

Tate, NAHUM (1652-1715), Irish poetaster and dramatist, born in Dublin, succeeded Shadwell as poet laureate (1692). Among his works are an adaptation of *King Lear*, *Panacea* (1700), and specially the *New Version of the Psalms* in conjunction with N. Brady (1696-98).

Tatian, Christian apologist, was born in Mesopotamia early in the 2nd cent. A.D., probably of Syrian parents. For the first half of his life he travelled widely, learning and teaching in the schools of heathen philosophy; but, coming to Rome, he attached himself to Justin, and, having embraced Christianity, commenced his own apologetic labours. His first work was the *Discourse to the Greeks*, in which he justifies his acceptance of Christianity. He takes up a position of strict asceticism (rejection of marriage, and of the use of flesh and wine), and sets forth a theory of dualism, which inclines to Gnosticism. His *Book of Problems*, dealing with difficult passages of Scripture, shows likewise strong traces of Gnosticism; while his views on marriage are fully developed in a treatise on Christian perfection. The work, however, to which Tatian owes his permanent place in church history is his *Diatessaron*, a kind of amalgamation of the four gospels, founded on the old Syriac version. It is in no sense a 'harmony,' being quite uncritical, its ruling principle being the rejection of all that seemed to connect our Lord with human nature (birth, genealogy, etc.). It is disputed whether the *Diatessaron* was first written in Greek (Harnack), and then translated into Syriac, or originally in the latter tongue (Zahn and most scholars), in which it had certainly a great vogue among the Syrian churches at an early date. A commentary, also in Syriac, was composed by Ephraem Syrus. See Hemphill's *The Diat. of Tatian* (1888), Hill's *The Earliest Life of Christ* (1894), Hogg's *Ante-Nicene Christian Library* (extra vol.); for criticism, Zahn's *Forschungen zur Geschichte des N. T. Kanons* (1881-91); and Rendel Harris's ed. of *Diatessaron* (1890).

Tatius, ACHILLES (called Achilles Statius by Suidas), Greek romance writer, was a rhetorician of Alexandria, and

flourished about 500 A.D. His romance, entitled *The Adventures of Clitophon and Leucippe*, abounds in digressions, and the style is disfigured by imitations of classical writers, and an excessive use of rhetorical embellishment. Edition by Boissonade, Lebas, and Hirschig, in Diderot's *Bibliotheca Scriptorum Græcorum* (1856). There is an Eng. trans. by R. Smith (1855).

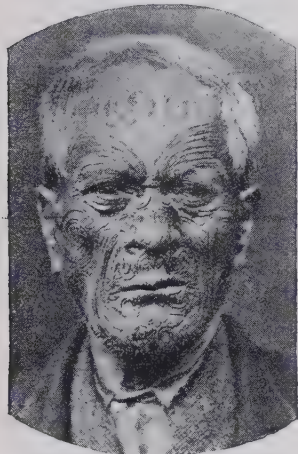
Tatta, tn., Karachi dist., Sindh, Bombay Presidency, India, 58 m. S.E. of Karachi; once the capital of Sindh. It manufactures silk and cotton shawls. Pop. (1901) 10,107.

Tattersall, RICHARD (1724-95), founder of Tattersall's, was born in Lancashire, and entered the service of the Duke of Kingston. In 1766 he set up as a horse auctioneer at Hyde Park Corner, London. In 1779 he bought from Lord Bolingbroke the famous racer 'Highflyer' for £2,500, and set up a stud farm, out of which he made a fortune. In 1788 he became proprietor of the *Morning Post*, in which the Prince of Wales was associated with him.

Tattersall's, the horse auctioneering establishment founded by Tattersall. It was set up first at Hyde Park Corner, London, and in 1865 was transferred to Knightsbridge Green.

Tattooing, the practice of puncturing or cutting the human skin according to certain patterns, the design being rendered permanent by means of colouring matter rubbed or injected into the incisions. The tattoo marks are for the most part tribal, totemistic, social, or sexual distinctions, but they are also more or less decorative. So far as is known, no race has so elaborated the art of tattooing as the Maoris. The custom is rapidly dying out among them, but it may be studied in General Robley's *Moko, or Maori Tattooing* (1896). Descriptions of tattooing in New Guinea, in Tierra del Fuego, and in Tunis are given in the Anthropological Institute's publication *Man* (1905). In Partridge's *Cross River Natives* (1905) will be found particulars of the custom in S. Nigeria; and it exists in other parts of Africa. Among the Eskimos, and also the Ainu of Japan, tattooing is confined to the women. Dr. Schrader points out that formerly several Indo-European races tattooed themselves, and he refers to Geiger in *Zur Entwicklungsgeschichte der Menschheit* (1878), and to Von Hehn. That tattooing was in use among the primitive Pelasgians of Greece has been shown by Professor Ridgeway, and in quoting this authority Miss Jane Harrison states that the Thracian Mænads were represented as tat-

toed on the arms and feet. As the custom was prohibited by the Mosaic law (Lev. 19:28), it was presumably practised at one time by the Jews. Gypsy women are the professional tattooers of modern Cairo, and there are several recorded instances of tattooed Gypsies. Elton cites Ovid's reference to the 'green Britons,' that of Sidonius to the 'blue Saxons,' and Isidore of Seville's description of the vermillion-painted Goths. These references do not necessarily denote tattooing, but there is no doubt as to the expressions applied by Herodian and Claudian to the Piets. British sailors have preserved the practice to modern times. See Joest's *Tätowiren, Narbenzeichnen, und Körperbemalen* (1887).



Tattooing as practised among the Maoris.

Tauler, JOHANN (1300-61), German preacher, was born at Strassburg. Renouncing a considerable fortune, he joined (1318) the order of Dominicans. Except for about seven years spent in Basel, he lived and preached all his life in Strassburg, exercising the most potent religious influence in the Rhine valley. His teaching was at once mystical and practical. See Preger's *Geschichte der Deut. Mystik im Mittelalter* (1874-93).

Taung-ngu, cantonment tn. in Taung-ngu dist., Lower Burma, 74 m. N.E. of Prome; formerly the seat of an independent king. It was taken by the British in 1852.

Taunton, munic. and parl. bor., Somersetshire, England, 31 m. N.E. of Exeter. The 15th-century church of St. Mary Magdalene has a beautiful tower (rebuilt 19th century). There are remains of a Norman and later castle (which replaced a Saxon fortress of wood) and a large museum; the grammar school is 16th century; St. Margaret's hospital represents a 12th-century leper house; and there are Church of England, Wesleyan, and Congregational colleges. The town is noted for its apples and cider. Collars and cuffs, gloves, and agricultural implements are manufactured. Taunton was occupied by Perkin Warbeck (1497); during the civil war it was bravely held by Blake for the Parliament; in 1685 Monmouth was here proclaimed king; and thereafter it was the scene of barbarities by Colonel Kirke's 'Lambs' and of Jeffreys' 'Bloody Assize.' A. W. Kinglake, historian of the Crimean war, and Samuel Daniel, poet laureate (b. 1562), were natives. Pop. (1901) munic. bor., 21,087; parl. bor., 19,723.

Taunton, city, Massachusetts, U.S.A., co. seat of Bristol co., 30 m. s. of Boston. It manufactures cottons and machinery. Pop. (1900) 31,036.

Taurus Mts., well-wooded mt. range, Germany, stretching 55 m. E.N.E. from the r. bk. of the Rhine near the confluence of the Main. The average elevation is 1,500 ft., the highest summits being the Grosser Feldberg (2,890 ft.), the Kleiner Feldberg (2,715 ft.), and the Altkönig (2,620 ft.). The lower slopes are occupied by vineyards, which yield wines that have a world-wide fame, such as Johannisberger, Rudesheimer, Hochheimer. The mineral springs of Homburg, Wiesbaden, Ems, and Nauheim are as famous. Among the conspicuous features are the ancient Saalburg, converted into a national museum in 1901; and the national monument, commemorative of the war of 1870-71—the statue of Germania.

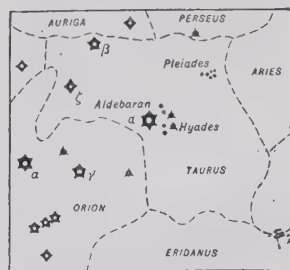
Taupo, the largest lake in New Zealand, in the centre of North Island, with an area of 230 sq. m. The Waikato flows through it.

Tauranga, tn. and port on Tauranga harbour, Bay of Plenty, North Island, New Zealand. Pop. (1901) 945.

Taurida, gov., S. Russia, bounded, except on N., by Black Sea and Sea of Azov; area, 24,497 sq. m.; pop. (1897) 1,455,900. The surface belongs mainly to the steppe zone; the soil is the 'black earth'; in the s. of the Crimea the Yaila Mts., a w. continuation of the Caucasus, offer the finest hill scenery of European Russia (Caucasia excluded). The principal river is the Dnieper, which borders the government on the N.W. The chief mineral deposit is salt. The principal industrial establishments are flour mills, tanneries, brick and tile works, tallow foundries, and tobacco manufactories. See also CRIMEA.

Tauromenium. See TAORMINA.

Taurus, or the Bull, the second sign of the zodiac (symbol ♉), entered by the sun about April 22. In the earliest calendars it marked the opening of the year. Aldebaran is its chief star, with which are grouped the Hyades. The Pleiades are situated in the neck of Taurus. At the tips of the horns are β , of 1.8 magnitude (Ar. *El Nath*, the 'Butting One'), and ζ Tauri, a spectroscopic binary showing a helium spectrum. R and S Tauri are variables of the Mira type; λ Tauri is an eclipsing star with a period of 3.9 days. The 'Crab' nebula was discovered near ζ Tauri by Bevis in 1731. Adjacent to it are the two variable nebulæ, N.G.O. 1554 and 1555.



The Constellation Taurus.

Taurus, ALA-DAGH, or BULGHAR-DAGH, the southern border-range of Asia Minor, stretching from the Euphrates to the Aegean Sea. The great highway between Asia Minor and Syria crosses at the pass of the Cilician Gates. General altitude, from 9,000 to

Tauchnitz, KARL CHRISTOPHER TRAUGOTT (1761-1836), German printer and publisher, born near Grimma. He set up in business (1796) at Leipzig as a printer, and became also a publisher and typefounder. The first to introduce stereotyping into Germany, he made a reputation by the accuracy of his editions of the Greek and Roman classics, and by his Bibles and musical compositions. His son, Karl Christian Philipp (1798-1884), sold the printing department (1854), and the publishing (1865). Christian Bernhard, Baron von Tauchnitz (1816-95), nephew of the above, born at Schleinitz, founded in 1837 the well-known publishing house in Leipzig. He began in 1841 the publication of a collection of British and American authors, numbering, down to 1906, about 4,000 vols.

Tauern Alps. See TYROL, ALPS OF.

10,000 feet. The Anti-Taurus is a northern extension from near the E. end.

Tautog, or **BLACK-FISH** (*Tautoga onitis*), a member of the wrasse family, common on the Atlantic coasts of N. America, is an important food fish. It may weigh from 12 to 14 lbs., and is blackish above, the under surface being pale. Very characteristic is the double row of teeth in the jaws.

Tavastehus, tn., cap. of gov. of same name, Finland, 70 m. N.N.W. of Helsingfors, has Kronoberg Castle (13th century), now used as a prison. Pop. 5,000.

Tavernier, **JEAN BAPTISTE**, **BARON D'AUBONNE** (1605-89), French traveller, was born in Paris. He visited the East in 1631, and again in 1638. His third journey was during 1643-9, through Persia, India, and Java. His fourth, fifth, and sixth journeys, from 1651 to 1668, made him more fully acquainted with Persia and India. He travelled as a merchant in precious stones. He was ennobled by Louis XIV. in 1669. His *Six Voyages* was published in 1676, the *Recueil* in 1679.

Tavira, seapt. tn., Algarve prov., Portugal, 39 m. w.s.w. of Huelva; has fisheries and trade in white wine and mineral waters. Pop. (1900) 12,178.

Tavistock, tn., Devonshire, England, 15 m. N. of Plymouth, on the Tavy, connected by canal (4 m.) with the Tamar. The principal buildings are the parish church (restored 1846), with interesting monuments, guild hall (1848), market (1853), new hall, Kelly College, and statue of Sir Francis Drake (born here). A 10th-century Benedictine abbey, subsequently rebuilt, was granted by Henry VIII. to Lord John Russell. The abbey gatehouse contains the public library. The chief industries are copper-mining and the extraction of arsenic. Pop. (1901) 4,728.

Tavoy, seapt., cap. of Tavoy dist., in Tenasserim, Lower Burma, 30 m. from the mouth of Tavoy R. The town lies low, and is subject to floods. Pop. (1901) 22,371.

Taxation. Taxation is the chief means by which a government obtains funds. A revenue may indeed sometimes be derived from the sale of lands belonging to the state, or from their rental, or from the management of agricultural, industrial, or commercial undertakings. The post office, for example, is a business which may be conducted with advantage by the state. A growing tendency is manifest for municipalities or other local authorities to take over or control the supply of water and light, which may easily become a monopoly, and,

under modern conditions, is a prime necessity of life, at any rate in towns. Where the government, whether central or local, charges for such services no more than their cost, the revenue obtained would strictly not be described as taxation, though it might be argued that much of what is commonly denoted by that name is in reality a payment made to government, in return only for specific service which it has rendered. Where, on the contrary, a charge is made exceeding the actual cost, the authorities levy a forced contribution from the payers, and, in effect, they raise a tax, whatever may be the precise title given to the charge. In ancient Greece an obligation to assist the state by equipping a ship or supplying a chorus was, in theory, a voluntary act; and modern reformers have suggested that it might be possible to allow taxpayers a discretion in distributing their payments between different objects. A distinction has been established between taxes and rates; but in practice the difference is mainly found in the circumstance that taxes are levied by the central or imperial government, and rates are demanded by the local authorities.

Excessive demands of taxation may exhaust or impair the vitality of a people, or arrest their economic progress. But the distribution of the burden is hardly less important than its total quantity. Adam Smith in his *Wealth of Nations* (book v. chap. 2) propounded the following rules or canons of taxation—(1) equality, (2) certainty, (3) convenience, and (4) economy. The first rule declared that the subjects of a state should contribute to its revenues in accordance with their respective ability to do so. The difficulty of the rule lies in the choice and application to practice of the test of ability. The maxim of certainty, which declared that the time, manner, and amount of payment should be certain, furnishes an excellent criterion for distinguishing between a wise and just and an oppressive and shortsighted government. Adam Smith made the sage remark that a small degree of uncertainty was a worse evil than a great amount of inequality. Uncertainty offers opportunity for corruption or extortion on the part of the collector; and the melancholy state of France before the revolution, like the stagnation found in Turkish dominions today, may be ascribed to the caprice as much as to the rapacity of the taxing officials. The third maxim, that of convenience, prescribed that a tax should be collected at the time and in the

way in which it was most likely to conduce to the convenience of the payer. On this ground the indirect taxation of commodities has been approved. Direct taxes, such as taxes on income, are levied directly from the individual, who is intended to bear the burden of the tax, and they bring him into immediate contact with the collector. They exert a wholesome influence on the vigilance of a community in watching the expenditure of government, for the taxpayers know that they will have to bear the cost of folly or extravagance. The maxim of convenience, however, is observed more completely in the indirect taxation of commodities by customs or excise duties—the one raised from imported foreign goods, the other levied on goods produced at home. In the first instance, such duties are taken from the importer or producer; but the intention is that they should recover them from the consumer, who, charged a higher price, virtually pays the tax when he buys the goods. So convenient, indeed, are the time and manner of payment that the consumer is often unconscious that he is taxed. The wide popularity of protection is due in no small measure to the fact that its positive effects in encouraging producers engaged in native industries are obvious, while its negative influence in raising the prices, which the consumer will pay, requires an effort of reasoning before it can be followed. In Great Britain, as the result of a series of fiscal reforms with which the names of Huskisson, Peel, and Gladstone have been successively associated, the taxation of commodities is now wholly based on free-trade principles. Where foreign goods are taxed, such as tea or tobacco, they do not compete with goods produced at home, and the taxation is levied for purposes of revenue alone, without any further motive of protection; or if, as in the case of wine, taxes are imposed on an article with which some home product, such as beer, may enter into competition, an equivalent excise duty is placed on the beer. A few articles of large general consumption are selected, and a low tax is levied. This course is followed from a wish to conform to the fourth maxim of Adam Smith—that of economy. The taxation of commodities, to some extent, must conflict with this maxim. It maintains that a tax should contrive to take as little more as may be possible from the pockets of the people than the amount which it brings into the coffers of the state. A tax accordingly is bad which requires an excessive number of officials for its collection. A tax, again,

is bad if it encourages evasion and fails to yield a revenue, and yet causes an expenditure of effort on the part of the payers trying to avoid the tax, and of the collectors attempting in vain to detect and prevent the fraud on the revenue. A tax is bad, lastly, if it compels industry and trade to be carried on in places or by methods less advantageous than those which might have been chosen had there been entire freedom. Protective taxes exhibit such failings, it is held, in an especial degree; but customs and excise duties generally are liable to some such objection. Officials are needed to prevent smuggling or illicit manufacture. The system of 'bonded warehouses' has been devised to meet another kindred evil. As the producer or importer advances the tax, and recovers it when he sells the goods, he must either himself forego, or else must charge to the customer, interest on the money locked up for the time; but by the method uniformly adopted in Great Britain the goods may be placed in 'bond,' and only pay the tax when they are actually removed for sale. Nor, in fact, is it possible to satisfy easily the maxim of equality, the most difficult of all, without some indirect taxation of commodities. In a sparsely settled country, such as our Australian or Canadian colonies, the collection of direct taxes may be in effect as much a violation of economy as customs duties upon imports. It may even prove impossible; and in older countries, thickly populated like our own, it is difficult to reach the poorer classes without recourse to taxation of commodities, and the attempt is certainly expensive. Ability to pay may indeed be measured by income, and an income tax is a conspicuous feature of the English fiscal system. Designed originally as a temporary tax for the special purpose of conducting war, or meeting the passing expense of simplifying a complicated tariff, it has become permanent. Theoretically, income has considerable merits as a measure of ability; practically a tax upon income gives rise to great inequality. Its collection involves either inquisitorial authority on the part of officials, or reliance, not always justified, on the honesty of the individual payer. Expenditure, again, is some test of ability, but it is open to impeachment on the ground that the necessary expenditure of one man may be larger than that of another. Realized wealth or capital, if adopted as the sole basis of taxation, would discourage saving, and offer a premium to imprudent, extravagant expenditure; and faculty of production,

although an ideal test, which admits of partial use in practice, is impossible to ascertain or gauge so generally as to justify its employment as the single criterion. The notion of equal sacrifice has led to the approval of the principle of graduation. Theoretically, it cannot be disputed that a tax exactly proportioned, for example, to income, implies a heavier burden on the smaller incomes; and, similarly, taxes *ad valorem* on commodities, which vary in rate with the quality of the commodity, are theoretically more just than specific taxes, which vary only with the quantity. In actual practice, on the other hand, *ad valorem* taxes cause complication and uncertainty; and, similarly, while proportional taxation of income is simple and obvious, graduation introduces, of necessity, refinements depending on arbitrary distinctions. In a democratic community severely progressive income taxes, or, in a less degree, death duties, may result in checking the growth of capital or encouraging its withdrawal abroad, and may thus injure the economic welfare of the nation. Degressive taxation, where the rate diminishes from a fixed point, as the income is smaller, has been for some time used in the income tax in Britain, by granting certain exemptions and allowing certain deductions; and progressive taxation, where the rate increases from a fixed point upwards, has been lately applied to the death duties. Such arrangements, it cannot be doubted, tend to realize a greater measure of equality, but the practical application of the principle is admittedly imperfect and hazardous. It is rendered more difficult by uncertainty in the incidence of taxation. There are taxes, like customs and excise duties, where it is manifest that the burden is intended to be shifted from the importer or producer to the consumer, and it is evident that the actual incidence corresponds, broadly at least, with this intention. There are other taxes, such as local rates levied on the occupiers of houses, where the determination of the incidence, whether wholly or in part, is open to great dispute. Some writers have maintained that it is a matter of comparative indifference where taxation is imposed, because the competitive forces at work will gradually diffuse the burden. It is clear that, without knowing the ultimate incidence of a tax or taxes, we cannot pronounce with certainty on their equality.

C. F. Bastable's *Public Finance* (3rd ed. 1903) contains a full treatment of the subject. Ricardo's *Principles of Political Economy*

and *Taxation* (1817) is chiefly occupied with the consideration of the incidence of various taxes; and the same subject is treated with fullness, from a modern standpoint, by E. A. R. Seligman in his *Shifting and Incidence of Taxation* (1899). The question of graduated taxation is discussed in the same writer's *Progressive Taxation* (1894). S. Buxton's *Finance and Politics* (1888) furnishes a detailed history of changes made in the fiscal system of Great Britain from 1785 to 1885. C. F. Bastable's *Commerce of Nations* (1892) contains a review of the chief issues raised in the controversy between free trade and protection. See also G. Armitage Smith's *Principles and Methods of Taxation* (1906), W. J. Ashley's *The Tariff Problem* (2nd ed. 1904), and A. C. Pigou's *The Riddle of the Tariff*.

Taxation of Costs. See COSTS.

Taxation of Land Values. See LAND VALUES.

Taxidermy is the art of preparing and preserving the skins of animals, and includes also the stuffing and mounting of them in such a way as to reproduce their living appearance. Arsenical soap is the preservative most commonly used, though some prefer a mixture composed of 1 lb. of white curd soap and 3 lbs. of whiting boiled together; to these while hot are added 1½ oz. of chloride of lime, and when cold 1 oz. of tincture of musk. For mammals, the best preservative is said to be a pound of burned alum and a quarter pound of saltpetre, well rubbed into the skin; the soapy mixtures are carefully applied with a brush to the wet surface of the skin. Feathers and furs are cleaned by lightly applying benzoline, then dusting on plaster of Paris, which is afterwards shaken out. Skins, when put away unmounted, should have camphor or naphthalene in the drawers or boxes containing them.

In skinning a specimen for taxidermic treatment, no pains should be spared to disturb as little as possible the fur, hair, or feathers, or scales in the case of fish or reptiles. In bird specimens the skull and certain wings and leg bones are left in their places. When the skins are to be put away in cabinets, the head, neck, and body are filled with tow, the skin of the stomach is sewn up, and after being allowed to dry they are stowed away with insect powder. In preparing a bird for mounting, its girth round the body should be taken before skinning, and also its length, following the form from the root of the tail to the top of the skull. On a piece of wire the length of the latter

measurement is constructed an artificial body of tow resembling in shape and size the bird's body. The protruding portion of the wire serves as a foundation for the neck. After the inside of the skin has been painted with the preserving preparation the false or tow body is enveloped within it, more tow or cotton being thrust down

pulled up into the orbits, so as to plump out the depressions. A wire is next thrust into the ball of the foot and up alongside the thigh-bone, the skin being turned back, and cotton being wound round the wire and the bone to provide the leg with flesh, as it were, and fill it out, and then the skin is returned. The ends of the wire on each side

the top, and so hold the structure together. The feathers of the tail, when spread, are spread upon a wire which goes through each feather. The wings are also held in position by wires, one from each side being pushed from above diagonally down and through the skin of the second joint. A touch of glue to the eyelids prepares them for the eyes, which in the case of small birds may be common black beads. Before mounting, the specimen should be left for a day or two to dry, with thread wound loosely over the whole body, securing every feather in its place. There is a school of taxidermists that does away with 'stuffing.' They make a model of the animal, posed as in life, which they cover with the damp skin, and furnish, in the case of large animals, with jaws, palate, tongue, and lips, exactly reproduced in plastic materials.

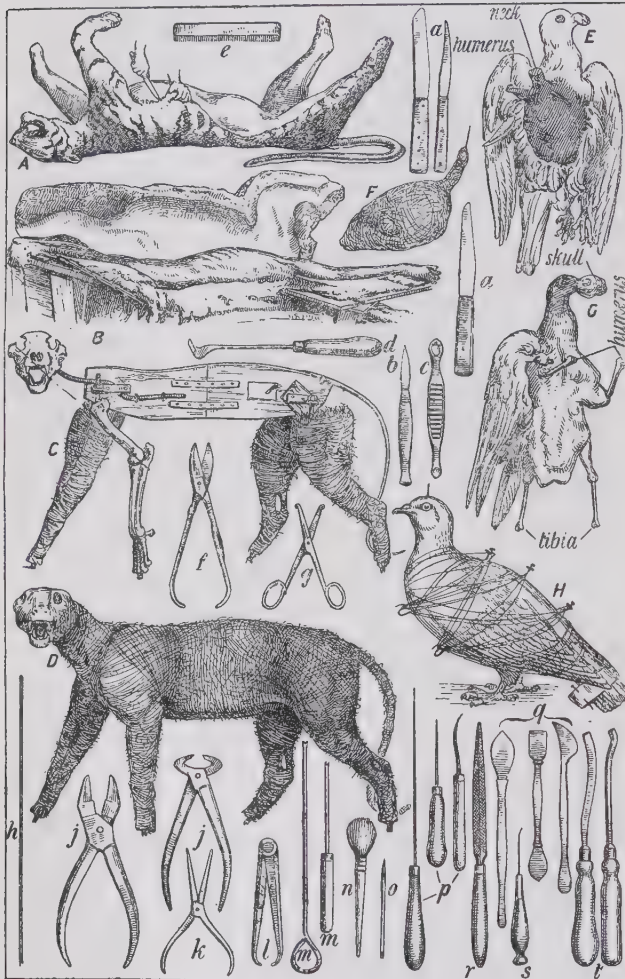
Taxidermy was practised in England in the 17th century, the period in which the Sloane collection, which formed the nucleus of the British Museum collection, was built up. See Montague Browne's *Practical Taxidermy* (1884); W. T. Hornaday's *Taxidermy* (1891); Oliver Davies's *Methods of the Art of Taxidermy* (new ed. 1900); Paul N. Hasluck's *Taxidermy* (1901).

Taxing-master. See COSTS.

Taxodium, a genus of hardy and half-hardy trees belonging to the order Coniferae. They bear deciduous leaves and monœcious flowers. *T. distichum*, the black or deciduous cypress, is an American tree, the timber of which is largely employed in the States. In swampy districts the roots of this tree often become covered with hollow protuberances or 'knees,' which are sometimes, according to London, employed for beehives. Other species are the Montezuma cypress (*T. mucronatum*), and *T. heterophyllum*, the little Chinese embossed cypress, which grows only to a height of some ten or twelve feet. All the deciduous cypresses are easily grown in Britain in moist situations.

Taxus, a genus of evergreen trees belonging to the order Coniferae. They bear dioecious flowers, the female catkins being followed by solitary, one-seeded fruits. The principal species is *T. baccata*, the common yew. Other species of *Taxus* are *T. canadensis*, the American yew or ground hemlock, a bushy plant; the Japanese *T. cuspidata*; and *T. globosa*, the Mexican yew. See also YEW.

Tay, riv. and firth of Scotland, flowing into the North Sea, rises (2,980 ft.) at the Argyllshire extremity of the Grampians, flows



The Processes and Apparatus of Taxidermy.

A. Removing skin from tiger. B. Casting body of tiger. C. Mannikin for tiger, showing structure. D. Mannikin for tiger, complete. E. Pigeon being skinned through opening under wing. G. The false body. H. Set up to dry, plumage bound down. *Tools*.—a, Skinning knives; b, scalpel; c, brain and eye scoop; d, skin scraper; e, steel comb for furs, etc.; f, shears; g, blunt-tipped scissors; h, bone drill; j, pincers; k, long-nosed pliers; l, calipers; m, stuffers; n, brush for plumage, etc.; o, triangular needle; p, piercers; q, modellers; r, triangular file; s, awl; t, gouges.

the neck and throat so as to fill entirely the cavities there. With the finest forceps the eyelid skins are pulled into position, the feathers arranged, and cotton

are left protruding below, and can be wound round the perch the bird is to stand on. The upper ends of the wire are pushed right through the artificial body and clinched on

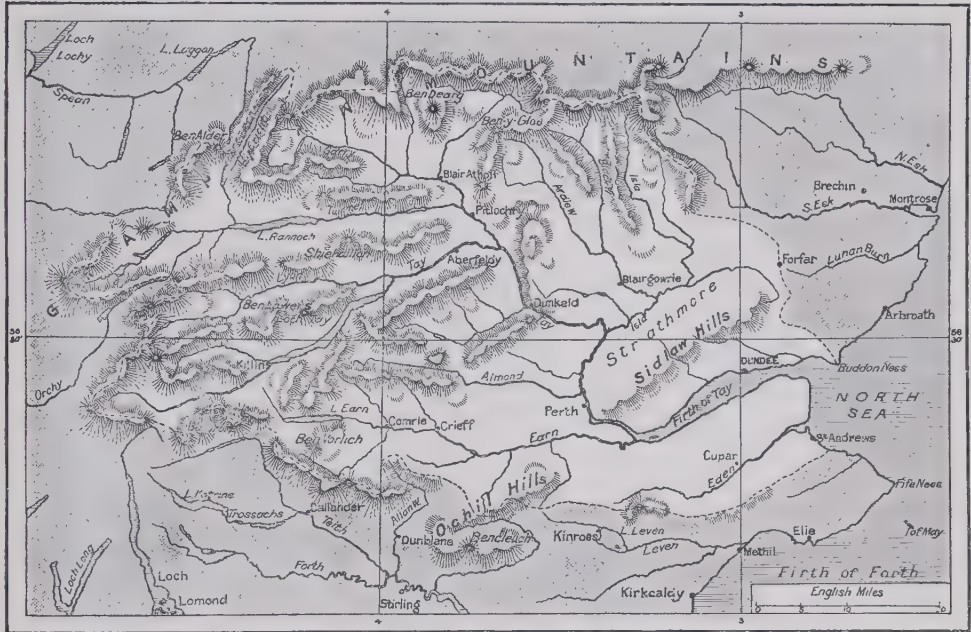
through Perthshire, and as a firth between Forfarshire and Fifeshire. Its tributaries on l. bk. are the Tummel and the Isla, and on the r. bk. the Braan, Almond, and Earn. Its course is distinguished by expansive lochs—Dochart, Tay, Lydoch, Rannoch, and Tummel. The total length is 118 m., of which the last 25 m., from the junction with the Earn, form the firth. At Dundee it is crossed by the Tay Bridge. The basin covers 2,400 sq. m. The river is navigable to Perth. The navigation to Dundee, the chief port, is much hindered by sandbanks. The Tay is the most valuable salmon river in Scotland—the fish caught annu-

much in demand in criminal cases, of which the chief was the Palmer poisoning case. He published *A Manual of Medical Jurisprudence* (1844), *The Principles and Practice of Medical Jurisprudence* (1865), both of which went through many editions; *Poisons in Relation to Medical Jurisprudence and Medicine* (1848), *On Chemistry* (1863).

Taylor, BAYARD (1825-78), American author, born in Chester Square, Chester co., Pennsylvania. He published *Ximena* (1844), and, as harvest of a pedestrian tour, *Views Afoot, or Europe seen with Knapsack and Staff* (1846). In the *New York Tribune* he published the records of his

of Goethe's *Faust* (1870-1), and in his unfinished biographies of Goethe and Schiller. Among his other works are *Poems and Ballads* (1854), *Poems of the Orient* (1855), and the novel *Hannah Thurston* (1863). See his *Life and Letters* (1884), and his wife's *On Two Continents* (1905).

Taylor, BROOK (1685-1731), English mathematician, was born at Edmonton, Middlesex. He published *Methodus Incrementorum Directa et Inversa* (1715), *Linear Perspective* (1715), *Contemplatio Philosophica* (1793). He was first secretary of the Royal Society (1714-18). See *Life* by Sir W. Young, prefixed to *Contemplatio Philosophica* (1793).



Basin of the Tay.

ally value £60,000. See J. Geddie's *The Tay* (1892).

Taylor, JOHN JAMES (1797-1869), English Unitarian divine, was born at Newington Butts, Surrey. He was minister of Mosley Street Chapel, Manchester (1821-53); was appointed principal and professor of ecclesiastical history in Manchester College. His chief work is *A Retrospect of the Religious Life of England* (1845). See Thom's *Letters*, with *Life* (1872).

Taylor, ALFRED SWAINE (1806-80), English medical jurist, born at Northfleet, Kent. In 1831 he became professor of medical jurisprudence at Guy's, holding the chair till 1877. His services were

travels in California (1849), and in Egypt, Asia Minor, and Syria (1851). Crossing (1852-3) from Bombay to Calcutta and thence to Hong-kong, Taylor joined Perry's expedition to Japan—an experience registered in his *Visit to India, China, and Japan* (1855). Other travels are recorded in *Northern Travel* (1858), *Greece and Russia* (1859), *At Home and Abroad* (1859-62). Secretary of Legation at St. Petersburg (1862-3), he went to Egypt and Iceland—recorded in his *Egypt and Iceland* (1874). His studies of the literature of Germany, to which in 1878 he was appointed United States minister, are gathered up in his translations

Taylor, SIR HENRY (1800-86), English dramatist and essayist, was born at Bishop Middleham, Durham, and appointed in 1824 to a clerkship in the Colonial Office, from which he retired in 1872. In 1869 he was created K.C.M.G. Taylor wrote four tragedies—*Isaac Commensus* (1827); *Philip van Artevelde* (1834), an admirable closet drama; *Edwin the Fair* (1842); *St. Clement's Eve* (1862). A comedy, *The Virgin Widow, or a Sicilian Summer*, appeared in 1850. *Lyrical Poems* were published in 1845, and *The Eve of the Conquest and other Poems* in 1847. His *Notes from Books* (1849) contains skillful dissertations on the poetry of Words-

worth and Aubrey de Vere. An edition of Taylor's works appeared in five volumes (1878). Taylor's *Autobiography* (2 vols. 1885) is charming. See also his *Correspondence* (1888), edited by Dowden.

Taylor, ISAAC (1730-1807), English engraver, was born in Worcester, made his way to London, and worked successively as a silversmith, a geographer, and a book illustrator. In 1774 he was appointed secretary to the Society of Artists. Among his best engravings are those for Richardson's *Sir Charles Grandison*.

Taylor, ISAAC (1759-1829), of Ongar, English engraver and author, was born in London. He worked as an engraver until 1796, when he became an Independent minister at Colchester, and at Ongar (1810). *The Assassination of Rizzio*, after Opie, is among his best engravings. Among his writings are *Self-Cultivation Recommended* (1817), *The Beginnings of British Biography* (1824). See I. Taylor's *Memorials of the Taylor Family of Ongar* (1867).

Taylor, ISAAC (1787-1865), English artist, author, and inventor, was born at Lavenham, Suffolk. He became an engraver, and designed many plates for his father and the books of his sister. His chief writings are *The Taylors of Ongar* (1867); *Natural History of Enthusiasm* (1829; 10th ed. 1845); *Home Education* (1835). See Taylor's *Personal Recollections* (1864).

Taylor, ISAAC (1829-1901), English divine, was born at Stanford Rivers, Essex, and was a son of the author of *History of Enthusiasm*. He became rector of Settrington (1875) and canon of York (1885). Among his best-known works are: *Leaves from an Egyptian Note Book* (1888), *Domesday Survivals* (1888), *The Plough Land and the Plough* (1888), *Wentwakes and Hundreds* (1888), *The Origin of the Aryans* (1890), *Names and their Histories* (1896). Canon Taylor's name was much spoken of in connection with his controversy in the *Times* with Canon Maccoll and Professor Freeman.

Taylor, JANE (1783-1824), English writer for the young, was born in London. In conjunction with her sister Ann she composed *Original Poems* (1804), and *Hymns for Infant Minds* (1810). The best edition of the joint works is that of 1877. Other works are: *Display, a Tale* (1815); *Essays in Rhyme* (1816). See I. Taylor's *Memorials and Correspondence of Jane Taylor* (1825).

Taylor, JEREMY (1613-67), Anglican divine, born at Cambridge. Laud appointed him fellow of All Souls College, Ox-

ford, and in 1638 he was presented to the rectory of Uppingham, Rutland. In 1642 he published *Episcopacy Asserted*. In 1644 the Presbyterians, then dominant, sequestered his living. He is doubtfully identified with a Dr. Taylor, made prisoner Feb. 4, 1644, at the defeat of the royalists before Cardigan Castle. It is certain that he was a prisoner in Wales, and, at length released, became a schoolmaster in Carmarthenshire. In 1647, three years after Milton's *Areopagitica*, the Anglican divine published his *Liberty of Prophesying*. In 1649 appeared *The Life of Christ, or the Great Exemplar*, which is rather an eloquent devotional commentary than a systematized history. *Holy Living* appeared in 1650, and *Holy Dying* in 1651. *The Golden Grove*, a devotional book, published under the protectorate, would seem to have landed Taylor in prison, probably on account of an injudicious preface. He was again imprisoned in Chepstow Castle; on what account is uncertain. He suffered a third imprisonment (1657-8) through the indiscretion of his publisher.

In 1655 his *Unum Necessarium*, a discourse on repentance, brought him under the suspicion of Pelagianism. He had long been maturing his *Ductor Dubitantium*, a famous work of casuistry, but it did not appear until 1660. At the restoration he was appointed to the see of Down and Connor, to which was added that of Dromore. Perhaps of all English prose writers he is the most poetic. His immense and broad learning is employed rather to illustrate than to convince; his quick imagination sometimes carries him away. The best life of him is that by Heber (1822), prefixed to the collected edition of his *Works*. *A Life*, by Gosse, was published in 1904.

Taylor, JOHN (1580-1653), the 'Water-poet,' was born at Gloucester. He became a London waterman, but was pressed into the navy, and was present at the siege of Cadiz (1596). He kept a public-house at Oxford from the beginning of the civil war until 1645, when he gave it up for another in London. Among his works are *The Pennyles Pilgrimage* (1618), describing a journey on foot from London to Edinburgh; *Travels in Germany* (1617), *The Praise of Hempseed* (1626). See the Spenser Society's edition of his *Works* (1868-9).

Taylor, NATHANIEL WILLIAM (1786-1858), leader of the 'New Haven' theology. He was born at New Milford, Connecticut. In 1812 he was pastor of a Congregational church at New Haven, and professor of theology in Yale College from 1822-58. He softened

the asperity of the popular Calvinism, and taught that the bias to sin which mankind derives from Adam is not necessarily in itself sinful. His *Works* were published by Noah Porter in 5 vols. (1858-9).

Taylor, PETER ALFRED (1819-91), English Radical politician, was born in London, and became a silk mercer. He started his public career under the auspices of the anti-Corn Law agitation. Taylor was member of Parliament for Leicester (1862-84). He wrote *Some Account of the Taylor Family* (1875).

Taylor, PHILIP MEADOWS (1808-76), Indian administrator and novelist, was born in Liverpool, and in 1826 entered the nizam's service. His first novel was *The Confessions of a Thug* (1839), and he acted as *Times* correspondent from 1840 to 1853. He administered the native state of Sherapur from 1841 to 1853. He returned to England (1860), and wrote *Tara, a Mahrattah Tale* (1863), *Ralph Darnell* (1865), *Seeta* (1873), *Tippoo Sultan* (1840), and *The Story of My Life* (ed. 1881).

Taylor, ROWLAND (d. 1555), English martyr, born at Rothbury, Northumberland; was rector of Hadleigh, Suffolk (1544), archdeacon of Exeter (1552), and canon of Rochester (1547). After Mary ascended the throne he was imprisoned as a heretic, and eventually burnt at the stake on Aldham Common, near Hadleigh. See Stow's *Memoirs* (1833).

Taylor, THOMAS (1758-1835), English Platonist, was born in London, and had a clerkship in Lubbock's bank. He became assistant-secretary to the Society of Arts (1798). After 1806 he devoted his time entirely to study and translation. His translations include parts of the works of Plato, Aristotle, Porphyry, and the hymns of Orpheus. See Axon's *Taylor* (1890).

Taylor, TOM (1817-80), English dramatist, was born at Bishop-Wearmouth. He was professor of English at University College, London (1845-6). From 1850-72 Taylor was secretary to the Board of Health. He became editor of *Punch* in 1874. His best-known plays are *Our American Cousin*, *Still Waters Run Deep*, and *To Parents and Guardians*.

Taylor, WALTER ROSS (1838), Scottish divine, was born at Thurso. In 1862 he was ordained minister of the Free Church at East Kilbride, and six years later was translated to Kelvinside Free Church, Glasgow, where he still ministers. He was appointed moderator of the Free Church General Assembly in May 1900, and was re-elected in October moderator of the first General

Assembly of the United Free Church of Scotland.

Taylor, ZACHARY (1784-1850), twelfth president of the United States, was born in Orange co., Virginia. In 1812 he defended Fort Harrison against the Indians. He served in the Black Hawk war (1832) and the Seminole war in Florida (1836-7). On the annexation of Texas General Taylor marched (1846) to the Rio Grande, Colorado, gained victories at Palo Alto and Resaca de la Palma, attacked and captured Matamoros and Monterey, and was also successful at Buena Vista. This victory led to the treaty of 1848. In the same year he was elected president. Taylor was called by his men old 'Rough-and-Ready.' See Howard's *General Taylor* (1892).

Tayport, or FERRY-PORT-ON-CRAIG, tn. and wat.-pl., on Firth of Tay, Fifeshire, Scotland, 3½ m. S.E. of Dundee, of which it is a residential suburb. Pop. (1901) 3,325.

T.C.D., Trinity College, Dublin.

Tchad, LAKE. See CHAD.
Tch aikovsky, PETER ILICH. See TSCHAIKOVSKY.

Tchebichev, PAFNUTI LVOVITCH (1821-94), Russian mathematician, was born at Borovsk in gov. Kaluga. From 1859 to 1880 he was professor of mathematics at the University of St. Petersburg. His best-known papers treat of prime numbers. He also devoted much attention to mechanical motion, and designed a calculating machine and various mathematical instruments.

Tchelyuskin. See CHELYUSKIN.

Tcherkesses, or CHERKESSES. See CIRCASSIA.

Tchernalev, MICHAEL GREGOROVITCH (1828-98), Russian general. He first gained distinction in the Crimean war. In 1864 he stormed Chirkend, and next year reduced Tashkend. Retiring (1874), he edited, in the Pan Slavist interest, the journal *Ruski Mir*. Commander-in-chief of the Servian army in 1876, he was defeated at Alexinat. Inciting (1879) a rising of the Bulgarians, he was arrested and sent back to Russia. He was governor-general of Turkestan (1882-84).

Tchernigov. See CHERNIGOV.

Tchernyshevsky, NIKOLAI GAVRILOVITCH (1828-89), Russian author, born at Saratov. Editor of a military paper, he was from 1853 one of the most active writers on the *Sovremennik*. In prison (1862-4) as a revolutionist he wrote his novel, *What is to be Done?* Condemned (1864) to exile in Siberia, he was (1883) partly pardoned. He translated into Russian Weber's *History of the*

World and Adam Smith's *Wealth of Nations* (1864). See his *Works* in 4 vols. (1868-70).

Tchikhatchev, PETER ANDROVITCH (1812-90), Russian scientist. Born in Gatchina, he travelled (1842-4), whilst attaché to the Russian embassy in Constantinople, through Asia Minor to Egypt. In the Czar's service he explored the Altai. In the study of its geology he made six journeys in Asia Minor (1847-58). His later travels, geological and botanical, included Algeria and Tunis. He wrote *Voyage Scientifique dans l'Altai Oriental* (1845), *Asie Mineure* (8 vols., 1853-68), *Lettres sur la Turquie* (1859), *Études de Géog. et d'Hist. Natur.* (1890).

Tchuktches. See CHUKCHES.



Tea Plant (*Thea sinensis*).

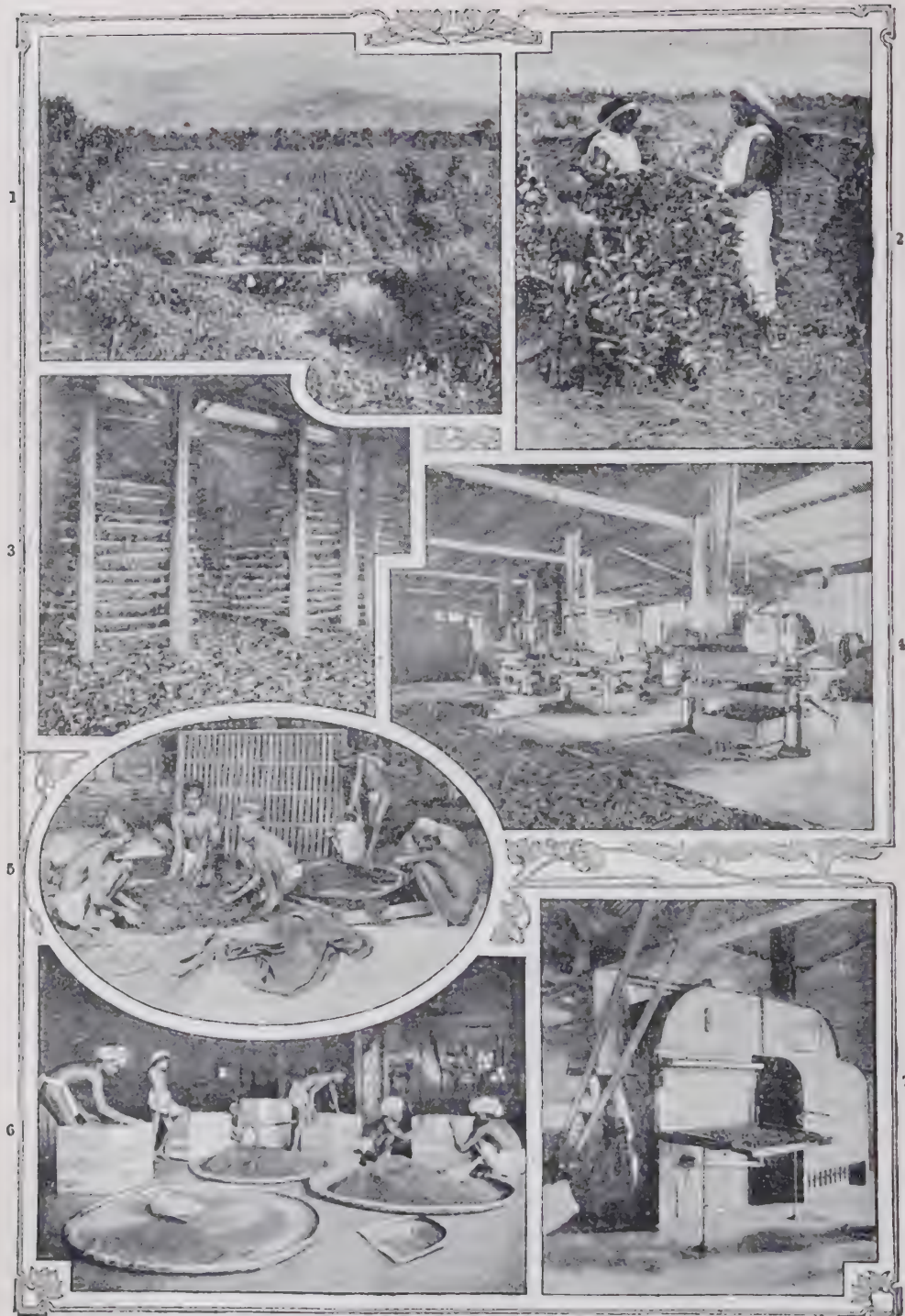
1, Section of flower; 2, fruit; 3, seed.

Tea, a name given to the dried leaves and young shoots of an Eastern tree or shrub, *Thea sinensis*, belonging to the order Ternstroemiaceæ. The so-called Arabian tea, derived from the shrub *Catha edulis*, and the tea-bearing shrub *Camellia theifera*, are quite unrelated to the other species. Of *T. sinensis* there are two varieties—*T. viridis*, a large evergreen shrub with spreading branches and thin leaves three or four inches in length, and *T. bohea*, which is of much smaller growth. The tea-plant is cultivated on a very large scale in China, Japan, India, and Ceylon, especially on hilly tracts, where it thrives best. It is raised from seed, and the leaves are gathered four times a year from the third year onwards. Of 'black teas,' among the commoner varieties are bohea, congou, souchong, and pekoe; whilst of the 'green teas,' hyson, young hyson, twankay, and gunpowder are perhaps the best known. Tea was not known in Britain until the beginning of the 17th century. According to Mr. Ball, the leaves of black tea are exposed to the sun and air on circular trays and treated as hay.

During this time an incipient saccharine fermentation is supposed to take place. Various modifications of flavour are produced by the management of this fermentation. During this time the leaves become flaccid and slightly tinged or spotted with red or brown colouring matter, and give out a peculiar odour. A certain change in this odour is an indication that the roasting must not be delayed. The leaves are then roasted in an iron vessel, and afterwards rolled with the hands to express their juices. Finally, they are dried in sieves placed over a charcoal fire in drying tubes. It is in the last stage of the process that the leaves turn black, though this change of colour is mainly due to the process of manipulation previous to roasting, and not to the action of heat. The leaves of green tea are roasted also in an iron vessel, but as soon as gathered, all fermentation of the leaves being studiously avoided. They are then rolled after the same manner as black tea, and finally dried in the same vessel as that in which they have been roasted, being constantly stirred about the while. They are also fanned in order to hasten evaporation, and so quicken the drying and the formation of the peculiar colour characteristic of this tea.

More tea is used in Great Britain than in any other Western country, but the process of making the infusion is very little understood. The following are the chief points to observe:—Keep the stock of tea in an air-tight tin canister. Allow from half to one teaspoonful of leaves to each half-pint of water. Have ready two warm, dry earthenware teapots, and place the tea leaves in one of them. Directly the water boils pour it on to the leaves, allow it to stand thereon for from one to three minutes, and then decant the clear infusion into the second teapot. The spent leaves should be at once thrown away.

Teachers' Guild, an association of over twenty years' standing, which aims at being thoroughly representative of all classes of teachers. It has been very active in working to obtain the status of a learned profession for teachers, and to break down as much as possible the barriers between primary and secondary education. The guild organizes holiday courses for teachers in France, Germany, and Spain. It has a benevolent fund to help members in cases of temporary breakdown or sickness. Its book of *Holiday Resorts and Recommended Addresses in the United Kingdom and Abroad* has reached its twenty-third annual issue.



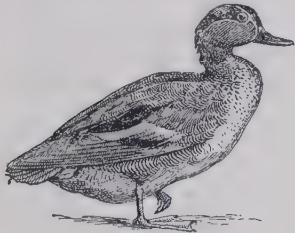
Tea: Cultivation and Preparation in the Darjiling District.

1. A tea garden. 2. Group of pickers. 3. Leaf spread to wither. 4. Leaf-rolling room. 5. Spreading leaf for fermentation. 6. Packing tea. 7. Down-draught sirocco tea-dryer.

Legal advice is given gratuitously to members by a committee which contains four practising lawyers. The guild is composed of some 3,600 members, of whom the majority are in its provincial and colonial branches.

Teaching of the Apostles. See DIDACHE.

Teak, a name given to certain valuable Asiatic timber trees belonging to the genus *Tectona* or *Theca*, a subdivision of the order *Verbenaceæ*. They are tall-growing trees, and bear terminal panicles of small whitish flowers with campanulate calyxes. The wood of the Indian teak-tree (*T. grandis*) is largely used in shipbuilding.



Teal.

Teal (*Nettion crecca*), the smallest of British ducks, is a freshwater form, feeding chiefly at night. In the breeding season it is distributed over most of Europe and temperate Asia, and winters in N. Africa and S. Asia. In N. America it is replaced by *N. carolinensis*, which occurs in Britain as an occasional visitor. The common teal has a length of about fourteen and a half inches, and has a chestnut head with a green eye-patch; the upper surface is marked with black and white; the speculum is black, green, and purple; the chest buff with black spots, and the rest of the under parts white. Closely allied is the garganey, or summer teal (*Querquedula circia*), a somewhat larger form, which breeds sparingly in the broads of Norfolk.

Tears. See EYE.

Teazel, or **TEASEL**, a genus of plants of which some are British species, and one, the so-called fuller's teazel, is employed in dressing broadcloth (order *Dipsacæ*). The flowers are borne in large heads, the receptacles bristling with prickly awns. The common wild teazel grows to some four or five feet in height, and bears purple flowers in July and August. The bristles of this plant are straight and not hooked, as are those of the fuller's teazel.

Teb, EL, group of wells, Nubia, Egypt, 44 m. S.E. of Suakin; was the scene of the defeat of the Mahdists under Osman Digna by General Graham, on Feb. 29, 1884.

Technical Education. Ordinary education has for its aim the harmonious development of the whole nature of the pupil. It becomes technical as soon as it sets itself to prepare the pupil for a particular art or craft by which he may make a livelihood. In the widest sense the preparation for medicine, divinity, or law is technical education, but it is not customary to include these in any treatment of technical education. Some authorities regard the workshop as an essential in any system of technical education; others deny that what is done in the workshop has any claim to be called education at all. The introduction of a workshop in a technical college does not by any means settle the question; for the meaning and aim of the workshop within and without the college are entirely different. In the college workshop the important thing is the effect on the pupil; in the ordinary workshop the important thing is the nature of the work turned out. The purely shop-trained man is much inclined to rest content with rule-of-thumb methods, and the severely practical training of the shop has no tendency to lead to a comprehension of, much less a sympathy with, the broad principles that are usually included under the name of theory.



Teazel.

1. Flower; 2. pistil; 3. bract.

The Germans are very generally held to lead the way in technical training. The British are

inclined to attribute the success of the German schools to their rigidly practical character. The Germans themselves believe that the essential thing is correct theory. The value of theory is being more and more recognized, even in ultra-practical America. There it is becoming common for whole classes of graduates in engineering to be engaged straight away by firms for immediate practical work. The Canadian Pacific Ry. have recently recognized the superiority of a training based upon scientific theory over one based on actual practice, by transferring the training of their skilled officers from their own shops and offices to the classrooms and practising shops of McGill University at Montreal.

Those who are in need of technical training are classified as (1) workmen, (2) foremen, (3) managers or employers. The foremen should be able themselves to perform all the processes that form the daily work of the men under their charge; but it is doubtful how far this applies to managers. Drawing, elementary science, and manual work now form part of the regular course in British elementary schools; but they are all used to develop the general powers of the pupil, without reference to any particular form of work he may have to do in later years. The purpose is to turn out a well-trained boy, ready to begin to learn some trade or profession. When the secondary stage is reached, it is necessary to differentiate to some extent between pupils who are looking forward to an official, a professional, or an industrial career. The next highest stage brings us to the avowedly technical. This again has two sides—(1) the study of certain arts and sciences in their specific bearing upon definite industries and professions; and (2) the actual practice in educational shops of the future life-work of the students. At present in Great Britain the technical education of the workmen consists mainly in a more or less rigidly enforced apprenticeship, accompanied by evening classes carried on largely independently of the employers, though occasionally subsidized by them. It is rare to find works in which arrangements are made to allow apprentices special privileges for carrying on their technical education. The foremen class is largely drawn from the more ambitious section of the workmen. The manager class is partly recruited from the foremen, and partly from those who have come into the industry on the commercial side.

The old Science and Art Department did excellent work in providing facilities for evening

classes in subjects that aided apprentices to acquire a knowledge of the principles underlying their callings. But these classes were too theoretical, and the City and Guilds of London Institute for the advancement of Technical Education (founded 1878) gave a much more practical turn to the development, and not only extended the scheme of technological examinations formerly conducted by the Society of Arts, but established several technical colleges, including that at Finsbury and the great Central College in Exhibition Road. As a result of the Royal Commission's report in 1884, and the passing of the City of London Parochial Charities Act in 1883, the polytechnic system was extended in London on the model of the well-known Regent Street institution.

Permissive powers of supplying or aiding the supply of technical and manual instruction outside the elementary schools were given to the local authorities (county and borough councils and urban sanitary authorities) by the Technical Instruction Acts, 1889 and 1891. The Act of 1889 authorized local authorities to supply or aid the supply of technical or manual instruction out of the local rate, not exceeding one penny in the pound in any year. The Local Taxation (Custom and Excise) Act, 1890, directed that the residue of the English share of the beer and spirit duties payable to the local taxation account under the Customs and Inland Revenue Act, 1890, after deducting £300,000 for police superannuation, should be distributed between county and county borough funds, and carried to the Exchequer contribution account of those funds; and it authorized the councils of counties and county boroughs to apply the whole or any part of that residue for the purpose of technical education within the meaning of the Technical Instruction Act, 1889. The Technical Instruction Act, 1891, explained the scope of the powers intended to be conferred on local authorities by the Act of 1889, and enacted that any part of the residue of the beer and spirit duties which had been directed by resolutions of the county council to be appropriated or set aside for the purpose of technical instruction, but had not been expended before the end of the financial year, should remain applicable for that purpose. The Technical Instruction Acts, 1889 and 1891, and subsections (2) and (3) of section 1 of the Local Taxation (Customs and Excise) Act, 1890, are repealed by the Education Act, 1902, which is applied to London by the Education (London) Act, 1903,

and technical instruction is now included in the higher education which is to be provided by the local education authorities under part ii. of the Act of 1902, and to which the whole residue of the beer and spirit duties is made compulsorily applicable. The Schools for Science and Art Act, 1891, affords facilities for the transfer of schools for science and art to local authorities; and the Technical and Industrial Institutions Act, 1892, facilitates the acquisition and holding of land by institutions for promoting technical and industrial instruction and training. The Welsh Intermediate Education Act, 1889, made provision for intermediate and technical education in Wales and Monmouth. This act is not repealed, but the powers of governing bodies constituted under it are transferred to the local education authorities under the Education Act, 1902.

In Scotland, school boards can provide technical instruction in their ordinary schools, and obtain grants from the Science and Art Department, and therefore little use has been made of the Technical Schools (Scotland) Act, 1887, which empowers school boards to establish technical schools in their districts. By the Local Taxation (Customs and Excise) Act, 1890, the residue of the Scottish share of the beer and spirit duty, after deducting £15,000 for other purposes, is distributed among county and town councils in relief of rates, and they are empowered to contribute any part of this money for the purpose of technical education. The Technical Instruction Amendment (Scotland) Act, 1892, explains and extends the purposes for which this money may be applied.

Teck, ancient duchy, named after a now ruinous castle in Swabia (Württemberg). The ducal title was first assumed by Adalbert, Duke of Zähringen, in 1152, and granted by Maximilian I. (1495) to the Duke of Württemberg. In 1863 the children of Alexander of Württemberg (1804-85) were raised to the dignity. His son Francis (1837-1900) married (1866) the Princess Mary of Cambridge (died 1897). Their daughter, Princess May, was married (1893) to George, Prince of Wales.

Tecoma, TRUMPET FLOWER, or TRUMPET CREEPER, is a genus of shrubs belonging to the order Bignoniaceae. The usually red or orange flowers are more or less tubular, and are generally borne in racemes or panicles at the ends of the branches. Moderately rich soil and plenty of water in summer are required. The common trumpet flower (*T. radicans*) is

a hardy North American species, but in Britain it likes the protection of a southern wall. It reaches a height of over twenty feet, bearing terminal corymbs of scarlet flowers. The Australian wonga-wonga vine (*T. australis*) also belongs to this genus.

Tecumseh (1768-1813), Shawnee chief. With his brother he planned (1804) the union of the Indians and the extirpation of the whites. On the repression of the rising (1811) Tecumseh joined the British. In the battle of the Thames (1813), Canada, the right wing under his command was routed, and himself slain. See *Life* by Eggleston (1878).

Teddington, vil. and residential dist. on the Thames, Middlesex, England, at head of tidal flow, 3 m. s.w. of Richmond, Bushey Park, with the national physical laboratory (1902), is adjacent. Pop. (1901) 14,036.

Te Deum Laudamus ('We praise Thee, O God'). The author of this very beautiful hymn is unknown, though an ancient tradition ascribes it to St. Ambrose and St. Augustine. An old Gallican psalter ascribes it to Nicetius; also Hilary of Poitiers has been mentioned. The earliest allusions to the hymn are in the rule of Cæsarius, bishop of Arles (c. 527). In the English daily office of morning prayer the *Te Deum* occurs after the lesson from the Old Testament, with the Benedictus as an alternative. In the Roman Catholic office it is used only on Sundays and certain festivals.

Tees, riv., England, rises on Crossfell, Cumberland, and flows mainly east, separating Durham from Yorks. In its upper course are the waterfalls of Caldron Snout and High Force, and below Middlesbrough it forms a wide estuary. Length, 75 m.

Teeth are calcified structures arising from the mucous membrane of the mouth in vertebrates, and are strictly homologous with the so-called skin-teeth or dermal denticles of elasmobranch fishes. By extension the term 'tooth' is also applied to hard structures found in invertebrates, as the grinding organs in the gizzard of the crayfish and the hard processes on the radula of molluscs. Teeth arise from papillæ of the mouth epithelium, and are primitively more or less conical structures. A typical tooth consists of the following parts:—Externally there is a layer of enamel, which arises from the outer layer of the embryo, and is an exceedingly hard substance, containing but little organic matter. Beneath the enamel lies the dentine or ivory of the tooth, which arises from the middle layer of the embryo,

and is not so hard as the enamel. Dentine is a substance analogous to bone, and is penetrated throughout by a series of fine canals, which open into the central cavity of the tooth—the pulp cavity. Within the pulp cavity lies the pulp, consisting of fine blood-vessels and nerve fibrils. In some teeth the pulp cavity is widely open below, while in other cases the fully-formed tooth becomes narrowed below, so that the pulp is constricted. Such a tooth is said to be rooted, the narrowed region being the root or fang, which penetrates into the gum. The other type of tooth is rootless, and teeth of this type continue to grow throughout life. Teeth frequently display also a third layer, known as cement. This, when present, is the most external layer of the tooth, and is frequently confined to the basal region.

Teeth are absent in cyclostomes, but are typically present in fishes. In fishes, as in most vertebrates except mammals, the teeth are usually only used for seizing and biting the food, not for purposes of mastication. They are frequently very numerous, and are not confined to the jaws, but occur over many of the bones of the mouth. They are usually all alike—a condition described as homodont. There is, however, no vertical replacement as in the familiar case of mammals. For example, in the shark, as the teeth are worn away in front their place is taken by fresh teeth, which grow forward from behind. In fish the teeth do not lose their primitive position as epidermal papillæ, and have no intimate connection with the bones upon which they are placed.

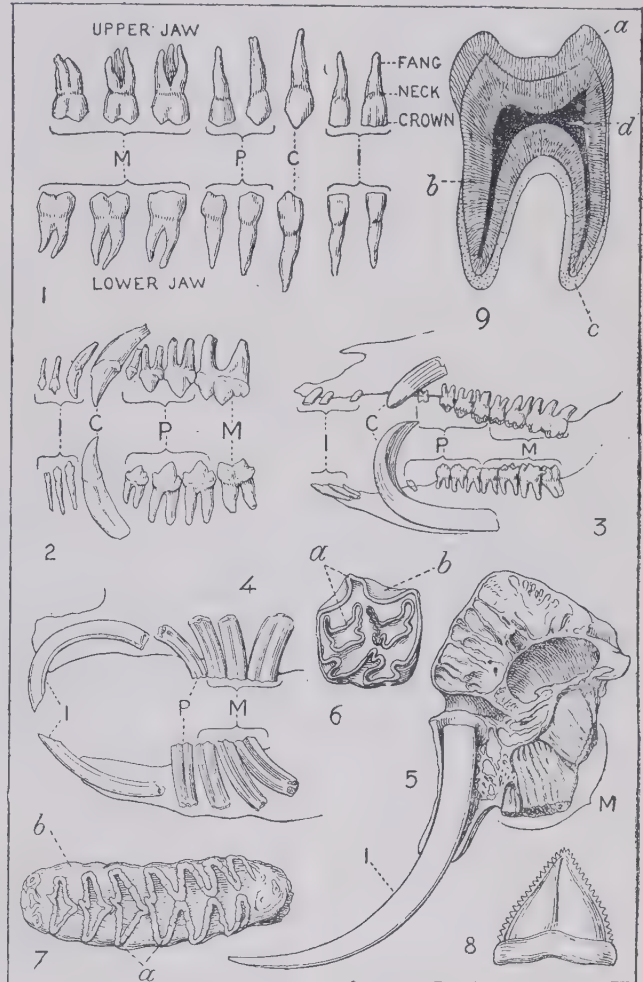
In living amphibia the chief difference from fish as regards the teeth is shown in the reduction in number. In certain fossil forms, however, the teeth attain a great complexity owing to the way in which the enamel layer is infolded.

In reptiles the teeth are also relatively few in number. The most noticeable advance is, however, the method of insertion. In reptiles generally the teeth are firmly fused to the bones of the jaw; but in the higher forms they are placed in sockets after a fashion similar to that which prevails in mammals. (For the peculiar fangs of snakes, see that article.) In certain fossil reptiles the beginnings of the conditions peculiar to the mammals have been observed. In all living birds teeth are absent, but some fossil birds had teeth of a reptilian type.

It is in mammals that the teeth invariably show a more or less perfect adaptation to the animal's diet and mode of life. Mammals

are largely classified by the characters of their teeth. All general statements regarding the teeth of mammals must, however, be regarded as referring primarily to the placental mammals. In monotremes mammalian teeth are present, so far as is known, only

The first notable peculiarity of the teeth of mammals is their want of uniformity: they are heterodont instead of homodont. With the difference of shape comes a well-marked difference of function. The anterior teeth (incisors) are adapted for biting—



Teeth.

1. Dentition of man. 2. Of hyena. 3. Of pig. 4. Of Patagonian capybara. 5. Section of skull of Indian elephant, showing dentition of right side. 6. Crown of upper molar of horse, showing enamel folds. 7. Grinding surface of molar of African elephant, with enamel folds. 8. Single tooth of blue shark. 9. Longitudinal section of human tooth. 1. Incisors; c, canines; p, premolars; m, molars. a, enamel; b, dentine; c, cement (*crusta petrosa*); d, pulp cavity.

in the young ornithorhynchus, and are there simple. In the marsupials the teeth show a general resemblance to those of the placentals; but the number and the succession are different, and cannot be readily referred to the same type.

i.e. cutting—the food; the next tooth to the incisors at each side is the canine or dog tooth, and is usually a weapon, as in the carnivores, or a sexual ornament and weapon combined, as in some ungulates (e.g. pig). Finally, there is a series of cheek teeth, whose

function is the mastication of the food. Generally speaking, they have broad crushing surfaces in herbivorous mammals, and cutting edges in carnivorous ones, for these bolt their meat in relatively large pieces. The cheek teeth are the most complex. The second peculiarity is the reduction in number. The teeth in mammals are entirely confined to the bones of the jaw—i.e. there are no teeth on the roof of the mouth, and the number is always fixed for the species. Further, in placentals in general the maximum number is forty-four, though there are some placental mammals in which this number is greatly exceeded. The third notable peculiarity of the mammalian dentition is that there are two sets of teeth, known respectively as the milk and adult dentition. The members of the adult dentition vertically replace the members of the milk dentition; but the adult set always contains more teeth than the milk set. Some mammals show traces of more than two sets.

The different kinds of teeth in a mammal are defined as follows. The teeth borne on the premaxillary bone are incisors, as are also the corresponding teeth of the lower jaw. The maximum number of incisors in a placental is three at each side above and below. The tooth immediately behind the suture between the maxillary and premaxillary bones is the canine, and the lower canine bites in front of the upper. There is never more than one canine at each side in each jaw. The premolars are those cheek teeth which replace the milk molars of the young animal. These teeth are called 'bicuspid' in human anatomy. Though only two bicuspid are present in man, yet four at each side, above and below, is the typical number for a placental. Behind the premolars lie the molars, which have no milk predecessors; the typical number of these is three. It is convenient to sum up the number of teeth in a mammal in what is known as a dental formula. The following is the dental formula

of the pig: $\frac{3-3}{2-3} i, \frac{1-1}{1-1} c, \frac{1-4}{2-4} pm.,$
 $\frac{2-3}{2-3} m. = 44.$ The upper row of figures indicates the teeth of the upper jaw, and the lower those of the lower jaw.

Man, like his near allies, has a relatively unspecialized type of dentition, adapted for a mixed diet. Owing to the shortening of the jaw which has taken place in all civilized races, the teeth are crowded together, especially in the lower jaw. In consequence there is little room for the third

molar, the so-called wisdom tooth, which should cut the gum at maturity; and this tooth often remains rudimentary, and does not cut the gum at all. In many other cases its development produces discomfort of such a nature that its removal becomes imperative. See also DENTISTRY.

Teething, of children. While the period of dentition is frequently associated with disturbance of health, the popular habit of attributing to teething practically every infantile ailment, from thrush to convulsions, is to be deprecated. The eruption of the teeth, however, is often accompanied by slight feverishness conducive to respiratory and alimentary catarrhs, neglect of which may lead to more serious troubles. But in healthy children some irritation of the gums, slight fretfulness, and transient sleeplessness are the most prominent symptoms of teething; and teething powders and mixtures are generally unnecessary, if not positively harmful. Equally foolish and irrational is indiscriminate gum-lancing. The following table shows the order in which the milk teeth usually appear, with the average age of the child at the time of eruption.

Central Incisors....	{ 2 lower 6 months.
	{ 2 upper 7 "
Lateral Incisors....	{ 2 upper 9 "
	{ 2 lower 10 "
First Molars (4).....	12 "
Canines (4).....	18 "
Second Molars (4).....	24 "

Teetotalism. See TEMPERANCE.

Tegea, tn., Arcadia, in ancient Greece, was usually allied with Sparta. After the battle of Leuctra, in 371 B.C., it joined the rest of Arcadia in becoming independent. In 222 B.C. it joined the Achaean League, and with the rest of that confederacy was conquered by Rome in 146 B.C. The foundations of the city wall have been discovered, and many small bronze and terra-cotta objects. Here was a magnificent temple of Athene, built by Scopas in 394 B.C.

Tegernsee, charming mountain lake between the Isar and the Inn, Upper Bavaria, 27 m. S.E. of Munich, at an altitude of 2,400 ft. The Gross Paraphie (2,680 ft.) is a point of vantage in the neighbourhood.

Tegelmeier, WILLIAM B. (1816), English naturalist and journalist, born at Colnbrook, Bucks. Studying variation in animals, he made many important observations, in part embodied in Darwin's *Origin and Variation*. Sometime lecturer to the Zoological Society, he has been on the staff of the *Field* for over forty-five years. His publications include *The Homing Pigeon* (1872), *Cranes* (1881), *Horses, Zebras, and Mule-breed-*

ing (with Captain C. L. Sutherland, 1895), *The House Sparrow* (1899).

Tegethoff, WILHELM, BARON VON (1827-71), Austrian admiral, born at Marburg in Styria. He took part (1848) in the blockade of Venice. In command of the Austrian squadron, he gave battle successfully (1864) to the Danes at Heligoland. In the war of 1866, Tegethoff, at the head of the Austrian fleet, defeated the larger Italian fleet off Lissa.

Tegnér, ELOF KRISTOFER (1844-1900), grandson of ESAIAS Tegnér; from 1883 chief librarian at Lund. Tegnér is a historian of great merit, with a style of rare charm. His *Gustaf Mauritz Armfelt*, in 3 vols. (1883-7), is a fascinating biography, while his *Bidrag till Kännedom om Sveriges Yttre Politik* (1872) is invaluable for the reign of Gustavus III.

Tegnér, ESAIAS (1782-1846), Swedish poet, was born at Kyrkerud in Vermland, and in 1802 became lecturer in philosophy at Lund University. In 1811 he wrote the fervidly patriotic ode *Svea*, which was crowned by the Academy, and marked a turning-point in Swedish literature. In 1812, after becoming professor of Greek, he was ordained. Hitherto he had remained neutral during the contest between the classical and the romantic school in Sweden; but the violence of the latter now moved him energetically to protest against their intolerant obscurantism, and his new poems powerfully contributed to the dissolution of 'Phosporism' in Sweden. In 1820 appeared his religious idyll, *Nattvardsbarnen*; in 1822 the poetical romance, *Azel* (Eng. trans. 1867); and in 1825 *Frithiofs Saga* (Eng. trans. 1901), which established his reputation as one of the greatest of Sweden's poets. In all his writings Tegnér took a way of his own, equally remote from French classicism and German romanticism. His lively wit, glowing fancy, and genuine humour, well controlled by a severe self-criticism, which aimed at and attained to absolute formal perfection, made him one of the most commanding figures in Scandinavian literature. As a critic also Tegnér has done excellent work. In 1824 he was made bishop of Vexjö. In his declining years he suffered from melancholia, and was for a time under restraint. See his *Collected Works* in 8 vols. (1882-5), Böttiger's *Tegnér's Lefnad* (1885); Brandes's *E. Tegnér* (1878), and Erdman's *Esaias Tegnér* (1896).

Tegucigalpa, tn., cap. of republic of Honduras, Central America, 75 m. from the Pacific, with a university. Pop. (1901) 34,692.

Tehâma. See ARABIA.

Teheran, city, cap. of Persia, situated on a fertile plain in N.W., 65 m. s. of the Caspian Sea. The climate is mild, but is extremely hot in midsummer. The city is surrounded with beautiful gardens. About 12 m. from it is the royal mosque of Shah-Abdul-Azim, where Nasr-ed-Din Shah was assassinated in 1896. Teheran has no commercial importance, but the only railway line existing in Persia is to be found here. The city is also the centre of Persian nobility. Pop. (1900) 280,000.

Tehuantepec. (1.) Anisthmus in Mexico, between the Pacific and the Gulf of Mexico. The soil is rich, forests are extensive and yield fustic and logwood, and there

Nicaragua and Guatemala. They are also known as Papagayo winds. The name Tehuantepec is derived from the districts where the winds originate.

Tehuelches, the aborigines of Patagonia, whose range extended originally from the Rio Negro into the eastern parts of Tierra del Fuego. They were noted for their tall stature, which, however, appears to have been exaggerated by the early writers. The Tehuelches, who are now reduced to a few nomad groups scattered along the eastern foot of the Cordilleras, speak a stock language entirely distinct from those of the neighbouring Puelches and Araucanians. All are true nomads, subsisting on fruits, herbs, and game, chiefly the guanaco and

Teinds, in Scotland, are tithes. A tenth part of the produce of lands was early claimed by the clergy as their right, and gradually came to be, by law, appropriated to their maintenance. Teinds came to be held by laymen under grants made by churchmen before the reformation. Such grants were annulled in 1564 unless confirmed by the crown, but confirmation was easily obtained. If the grants were not confirmed, the teinds fell to the crown, and so did those still in the hands of the church at the reformation. The latter were conferred, after the reformation, upon lords of erection; while some teinds which were payable to the bishops of the reformed church fell to the



Teheran: Place des Canons.

are large pasturages. A railway, 192 m. long, and rising near the Pacific to a height of nearly 700 ft., connects the ports of Coatzacoalcas, on Campeachy (Campeche) Bay, and Salina Cruz, on the Bay of Tehuantepec, where extensive harbour works were completed in 1896. Suggestions have been several times made since the days of Cortez (1520) to construct here an inter-oceanic canal, and the American Eads proposed to build a ship railway; but neither of these schemes has been carried out. (2.) Town, on the river of the same name, 19 m. N.W. of Salina Cruz. Pop. 8,000.

Tehuantepec Winds are strong winds, analogous to the mistral and bora, experienced on the Pacific side of Central America. They blow from the N.E. and N.N.E. on the coasts of

rhea, which are captured with the bola and lasso.

Teignmouth, seapt. and bathing resort, Devonshire, England, at mouth of Teign, 12 m. s. by E. of Exeter. The Den is a promenade fronting the sea, and a bridge connects with Shaldon on the opposite side of the Teign. There is a good harbour. Yacht-building and fisheries are carried on. Pop. (1901) 8,636.

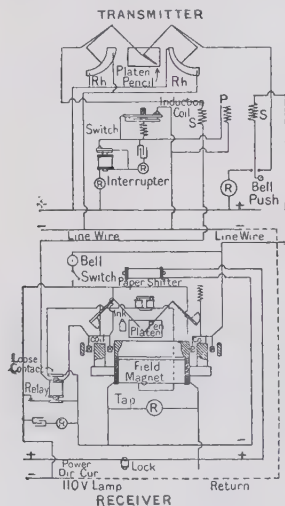
Teignmouth, JOHN SHORE, LORD (1751-1834), entered the service of the East India Company in 1769 as a cadet. He was member of the general committee of revenue, and member of the Supreme Council. In 1793 he was appointed governor-general of India, an office which he held for four years, receiving on his retirement the title of Lord Teignmouth.

crown on the abolition of the episcopacy, and in many cases were granted out to subjects. Under arrangements made in the reign of Charles I., and ratified by Acts of 1633 and 1690, teinds which were formerly levied in kind came to be regarded as a fixed burden on land, subject to be redeemed or purchased by the owner of the land, and when redeemed to be payable according to a fixed valuation. After the reformation the reformed clergy only obtained a small portion of the teinds, but the stipends of the parochial clergy of the Church of Scotland are still payable out of them, and unexhausted teinds afford a fund from which ministers' stipends may be augmented. The teind court, which has jurisdiction with regard to all questions connected

with teinds, consists of the judges of the Inner House of the Court of Session, and the second junior lord ordinary. See Elliot's *Teind Papers* (1874) and *Teinds* (1893).

Tekir-dagh. See **RODOSTO**.

Telamon, in ancient Greek legend, a son of Æacus, and brother of Peleus; he and Peleus slew their half-brother Phocus, and Telamon had to flee from Ægina to Salamis, where he married the daughter of the king, and afterwards himself became king of the island. He took part in the Calydonian hunt and the Argonautic expedition, and with Hercules took Troy from Laomedon. He was father of Ajax and of Teucer and Trambelus.



Teleautograph.

Teleautograph, or automatic reproducing telegraph, an arrangement by which a message written, or a sketch made, on a paper at one end of the line is at the same time reproduced identically and automatically at the other end. Little practical application of the invention has been made in Britain, but in America it has been used to some considerable extent. The transmitter is connected with the (distant) receiver by two line wires, either direct or through a central exchange station, each station being equipped with a 'set' of transmitter and receiver, associated together. The message is written in pencil on a roll of paper, the motion of the pencil being resolved, by a system of levers, into component rotary motions, which are used to control and vary the currents in two distinct electrical circuits. The receiver contains two light coil-springs of fine copper wire,

suspended within the circuit of a strong electro-magnet. These are acted upon by the two line currents from the transmitter, and move vertically in accordance with the variation in current, actuating at the same time a series of levers which communicate motion to a recording pen. The pen, which is controlled automatically by a separate induction coil, writes in ink on a series of slips of paper, producing an identical copy of the marks made by the transmitter pencil at the other end of the line.

Telav, tn., Russia, Transcaucasia, Tiflis gov., 106 m. from Tiflis. The capital of the kingdom of Kakhetia, it was founded in 893, but was destroyed in the 16th century by the Persians. It contains the ruins of two fortresses. It has a pilgrimage church, and is the centre of the wine trade. Pop. (1897) 11,810.

Telegonus, a son of Circe by Odysseus. He was sent by her to find his father, and, landing in Ithaca, was attacked as a pirate by Odysseus and Telemachus. He slew Odysseus, not knowing who he was. Then, at the command of Athena, he, with Telemachus and Penelope, took Odysseus's body to be buried in Circe's land, Ææa; afterwards he married Penelope. He was said to have founded Tusculum and Præneste in Italy.

Telegony. See **HEREDITY**.

Telegraph, MILITARY. The military telegraph is used close to the front of an army in the field to establish communication with more permanent lines in rear, and to supplement existing lines. It is worked by specially trained men of the Royal Engineers. On a peace footing the telegraph battalion consists of two companies at Aldershot, and a third in London. In war time the strength is increased by the enlistment of skilled telegraphists from the post office service. The instruments, appliances, and even the offices are carried on vehicles, the wire being unrolled from a drum as the detachment advances. Trees and other existing objects are utilized for supporting overhead wires. The cables and wire being covered throughout, no insulators are needed. A telegraph division of the Royal Engineers consists of 6 officers and 238 non-commissioned officers and men. It carries 32 miles of cable and 60 miles of wire in one-mile lengths.

Telegraph Plant, a common name for *Desmodium gyrans*, an Asiatic herb belonging to the order Leguminosæ. It is sometimes cultivated as a stove plant, requiring a light loamy soil with plenty of leaf-mould. It

is easily raised from seed sown in February. The telegraph plant bears panicles of purplish flowers, but it is chiefly curious by reason of the property possessed by its small lateral leaflets of moving in various directions when the sun is shining. This property is discussed in Darwin's *Power of Movement in Plants* (1880).

Telegraphy. *Introductory.*—A system of optical signalling, the shutter system, towards the close of the 18th century provided a chain of stations between London and the English Channel, and in this way the daily time signal passed between London and Portsmouth in less than half a minute. Foreshadowing an electrical system of signalling, a writer (Charles Morrison) in the *Scots Magazine*, in 1753, detailed a system by which any message might be spelt out. He would, he said, provide a wire (carefully insulated throughout its length) for each letter of the alphabet. At the receiving end of the line each letter, on a separate bit of paper, would lie under the extremity of its own particular wire. The operator at the sending end would charge in turn the wires required to spell out a given word, and at the receiving end the corresponding letters, rising in turn to the attraction of the individual wires, would render the word to the operator there. In Geneva, in 1774, a system closely resembling this in fundamental principle was invented independently, and indeed was worked to some extent. Such systems, however, based on signalling by purely electrostatic action, proved quite outside the bounds of ordinary commercial realization.

From the discovery by Oersted in 1820 that a suspended magnet could be rotated or 'deflected' from its original position by a current-carrying conductor, Cooke and Wheatstone, working together, were enabled, in 1835, to present to the world their five-needle telegraph (requiring five line wires), succeeded later by the double-needle (with only two wires), and ultimately by the single-needle (with but one wire), each needle having its own independent communicating line wire connected to its own deflecting coil. To this day the last-named system continues in practical favour on many British railways because of the sensitiveness and reliability in the 'receiving' action, albeit it is a comparatively low speed system. Following Sturgeon's invention of the electro-magnet in 1825, Morse laid, in 1836, the foundation of the present overland telegraph systems by the introduction

of the system which bears his name.

In the early attempts at transmarine telegraphy enterprise was baffled for a time, not only in constructing a reliable submarine line conductor of the current, and placing it securely in position on the sea bottom, but also, on long cables, in devising receiving apparatus properly adapted to the character assumed by the signalling current in the course of its transmission through that conductor. But the Morse apparatus, with the low speed of between one and two words per minute through the cable, was replaced by the Thomson (now Kelvin) instrument, affording a speed tenfold as great—the latter, strangely enough, an ingenious derivation from the single-needle system. Later still, in 1870, Lord Kelvin evolved the siphon recorder, which writes the transoceanic message in telegraphic characters upon a strip of paper—a system now universally employed on cables of any great length.

Telegraph Systems.—The telegraph systems of to-day fall naturally into four classes:—(1) Signalling, (2) alphabetic, (3) writing, and (4) facsimile. The third class has been adopted to a limited extent; but the fourth class has, as yet, scarcely advanced beyond experiment. For the transmission of electrical signals without the agency of line wires, see ELECTRO-MAGNETIC WAVES. The electrical transmission of articulate and other sounds finds treatment under TELEPHONY.

Broadly speaking, the working of signalling systems is based on the production of two particular signals. By these two signals, combined where desired into sets which need not exceed four signals, each letter of the alphabet can be indicated. For figures, punctuation marks, etc., more than four signals may be necessary for distinctiveness. In the Morse signalling systems—which include the Morse printer, the Morse sounder, and the Wheatstone automatic—the two signals are distinguished from each other by duration, one signal being short (a dot), the other three times as long (a dash). The accompanying illustration gives the signals for each letter of the alphabet in the Morse code.

Of the Morse receiving instrument the essential parts are, as in Fig. 1, an electro-magnet E, over which stands an iron keeper or armature A, withheld from the electro-magnet by the contracting pull of a spiral spring S. When a current is started through the electro-magnet coil, the armature at once drops downwards

by attraction; when this current ceases, the spring instantly pulls the armature back to its original or normal position. With a brief current corresponding to the duration of a dot signal, the armature remains down for only that duration of the current, whereas with a current lasting for three times that period, the armature remains down correspondingly long—i.e. for the duration of a dash signal. In Fig. 2 appears a side view of the parts already given, together with certain accessory parts, as well as those for recording the dot and dash signals upon a strip of paper.

E .	T —
I . .	M — —
S . . .	O — — —
H	Ch — — — —
A —	N . .
W — —	D . . .
J — — —	B
U — — — —	G
V — — — — —	Z
R . . .	K — — —
L	C — — — —
P	Y — — — — —
F	X — — — — —
	Q — — — — —
1. — — — — —	6. —
2. —	7. —
3. —	8. —
4. —	9. —
5. —	0. — — — — —

Morse Code.

L, a brass lever hinged at H, carries the armature A by rigid attachment, while an extension of L towards the left carries the ink-wheel W partially immersed in a special ink in the ink-well I. Immediately above W passes a narrow strip of paper, usually green or white, uncoiling from a roll (not shown), and dragged through guides, past W, by friction rollers, these rollers and the ink-wheel being rotated by spring-driven clock-work. Adjusting screws, S₁ and S₂ respectively, determine the best normal position of the armature, and the extent of approach that the armature may, for working advantage, make towards E. The instrument acts thus. A current starting E causes A to be attracted, which brings down L also. With the fall of L, W is raised against the passing paper. W continues, then, to produce a black ink mark upon the paper until the cessation of the current causes A to recede from E and W to fall from contact with the paper. In this way dot and dash marks can be recorded. To produce the signals, the sending telegraphist, by means of a suitable appliance called a key, connects to the circuit—for the dot or the dash time, as the case may be—a battery, which sends a current through a wire to the Morse instrument at the receiving office. From Fig. 3 it will be observed how this can be accomplished by

the depression of the knob of the key K for the requisite signal time, the path of the current, if the key be depressed, being indicated by arrows.

By careful listening to the to-and-fro clicking of the armature lever against the stops S₁ and S₂, operators acquired the power to distinguish between the signals from these sounds alone, so that in time the recording portions of the instrument were discarded, and what remained constituted the now widely-used sounder instrument. The principle of actuating the sounder directly by the line current is termed direct working.

Line resistance and current leakage (to earth) over the surface of the insulating supports combine to reduce the value of the 'received' current, on long lines particularly, and more especially during wet weather. Where this difficulty tends to be acute, a sending battery is used sufficient to actuate a very sensitive receiving portion called a relay, which has an armature action corresponding to some extent with that of a sounder, and with each signal this armature responds exactly as would the armature of the sounder which is replaced by it. Since this relay armature, during what we may call its depression periods, closes a home or local circuit containing a battery of a very few cells and the sounder itself, the sounder armature repeats the movements of the relay armature, and gives out the signals to the receiving operator. The relay armature is too light and finely set to give out a sound of 'readable' volume. This system of working is known as the single-current sounder with relay. Fig. 4 furnishes a simple form of relay to indicate the action, R being the relay and S the sounder.

This relay belongs to the *non-polarized* class, there being no permanent magnetism associated with it, and its comparatively low sensitiveness limits its use. In the Post Office standard relay (Figs. 5, 6, 7) we have a highly sensitive instrument, one of the *polarized* class. In this form the first distinguishing feature lies in the absence of the yoke, an arrangement which provides two core poles at the lower ends of the coils. The next modification is the armature arrangement, consisting of one soft-iron tongue between the upper ends of the cores and another tongue between the lower ends, the two tongues in their parallel position being attached by their similar extremities to a pivoted vertical spindle, outside the interpolar spaces, while the other ends of the tongues, within the interpolar

spaces, stand free to rotate together horizontally towards one side or the other according as the magnetic variation of the cores determines. A permanent horse-shoe magnet, in a fixed position, presents its one pole close to the spindle end of one tongue, and its other pole similarly to the other tongue. By the action of this permanent magnet each tongue manifests a magnetic pole at its free extremity; and, in turn, the inductive action of the tongues upon the cores causes the two upper ends of these latter to have poles of one magnetic name, and the two lower ends poles of the opposite name. If a comparatively weak marking current traverse the coils, the pole on one side will be strengthened, while that on the other will be weakened, so that the tongues will be pulled over from their normal position on one side to close a local circuit on the other side, and so actuate the sounder. But long lines demand also some modification in the signalling current to permit of reliable signals at fair rates of speed. The double-current system attains this by employing a signalling key, which sends a reverse current to line throughout the intervals between the marking signals, this reverse current (or 'spacing' current) wiping out, as it were, the residue of the 'marking' current static charge of the line, and otherwise assisting the polarized relay tongues to regain their open circuit position with desirable promptness and ease. In the cases so far described the working of the key is entirely manual, and reaches a speed of usually thirty words per minute; but by employing a sending instrument with suitable automatic action, the successful speed of signalling to a polarized relay may be raised to six hundred words per minute, line considerations permitting.

In the Wheatstone automatic system the message to be sent is first prepared on a strip of paper by means of a mechanical instrument so manipulated by an operator that the paper is perforated with holes corresponding to the dot-and-dash signals intended to be transmitted. This perforated slip, when run through the automatic transmitter, controls certain moving parts in such a manner as to impart to a small signalling lever the exact movements of a manual key, and the requisite currents are sent to line accordingly. To keep the transmitter continuously fed with this slip obviously demands the services of a number of perforating telegraphists. Necessarily, for this high-grade speed the receiver must record; the arrangement

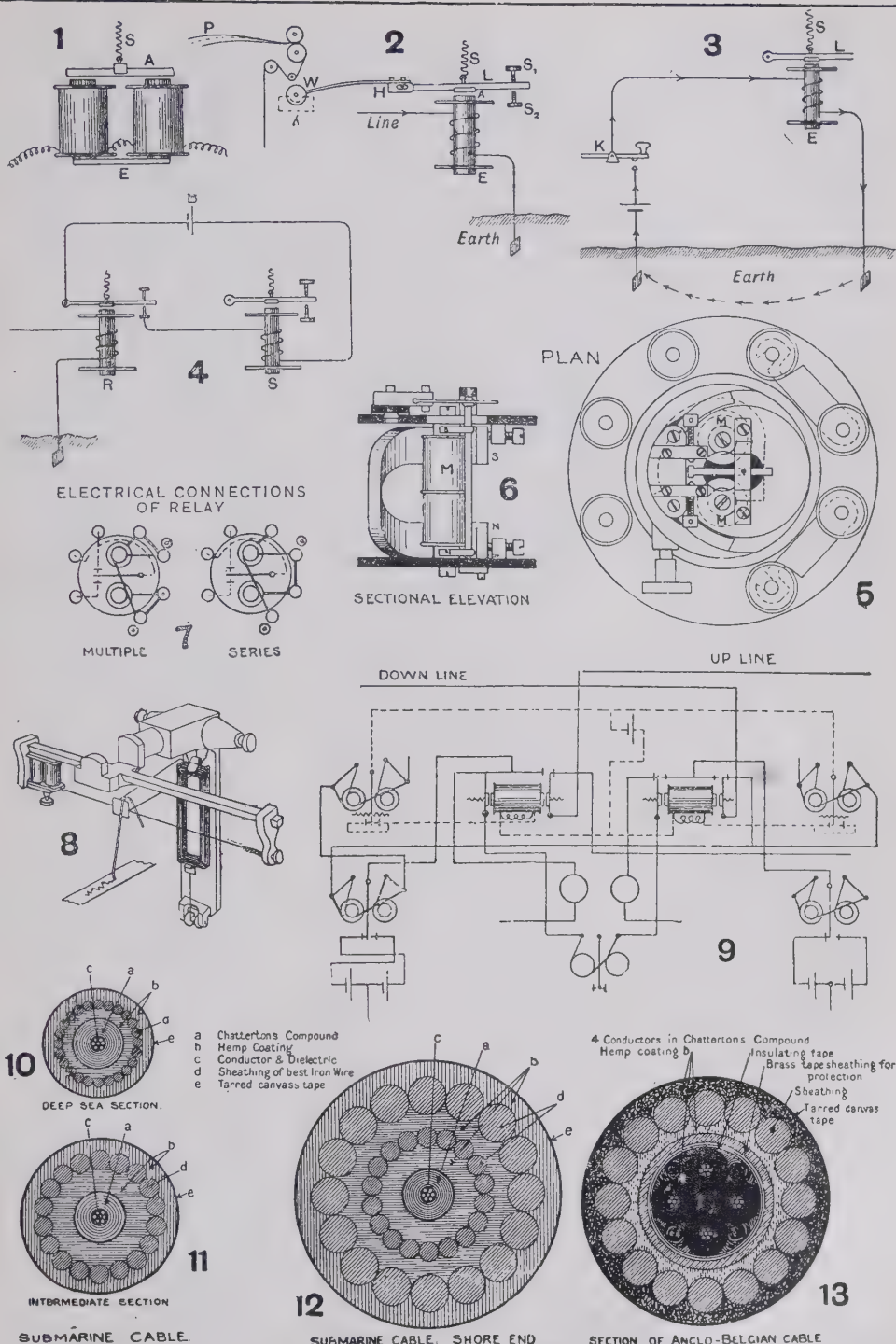
for this is that of the standard relay, with the tongue system carrying a suitable ink-wheel to or from the passing receiving slip of paper. As the paper runs from the instrument at great speed, it is rapidly and methodically kept divided amongst an appropriate number of writing telegraphists, who are thus simultaneously and continuously occupied in transcribing the messages from the printed signals. This system, the standard high-speed system of the world, finds very large employment in both Britain and the United States. In the transmission of identical press messages it is peculiarly serviceable, for a number of perforated slips may be produced at one process of perforation. Still further, any one line wire may pass through several towns, and it is arranged that the current traversing the coils of a receiver in each such town shall simultaneously record the same press message at all these towns, or at any selection of them.

All the systems just described, while essentially one in principle, may be made to work in both directions at one time on one wire by the *duplex* method. The double-current sounder (or Morse) system admits of this arrangement being elaborated to permit of four messages proceeding simultaneously on one line, under *quadruplex* working, in which two telegraphists send from each end of the line, and thus altogether eight telegraphists—four sending and four receiving—operate the line. Even the Wheatstone automatic system, with its own allotment of operators, may be combined with the double-current sounder system to provide quadruplex working, but very high speeds are not practicable. Finally, in *multiplex* working, as many as six messages may be in simultaneous progress on one line, with no fixed stipulation as to direction of sending. The fundamental principle of multiplex working is quite distinct from that of duplex and quadruplex.

To enable all these systems to work satisfactorily on circuits specially long, an apparatus set, constituting what is known as a 'repeater,' is introduced at one or more points on the line (Fig. 9) to repeat electrically the signal forward through the line towards the receiving office, because even the advantage of local relays and of double-current signalling does not suffice to give reliable results on such lines. Suppose, then, a London-Edinburgh line to have a repeater at Leeds. By the presence of this instrument the line becomes divided at Leeds into two practically independent circuits.

In the London-Edinburgh line, at Leeds, are the coils of a standard relay, the tongue system of which, instead of closing merely a local circuit, acts as a signalling key lever to connect a battery into circuit on the Leeds-Edinburgh length. Thus when London sends a signal, its attenuated current reaches Leeds with perhaps just sufficient strength to carry the relay tongue system (connected by the line to Edinburgh) against a battery contact, and keeps the tongue there while that particular signalling current from London lasts. To this battery-contact one pole of a battery is permanently connected, the other pole being to earth, with the result that while a signalling current is flowing from London to Leeds in the line, the repeater sends, from its own battery, a strong signalling current into the Leeds-Edinburgh length of the line, every individual signal being thus repeated in either direction as required.

The other signalling systems employ two signals, distinguished from each other by position. Take an ordinary vertical galvanometer. Pass a current through its coil in one direction, and the pointer on the dial face will be seen to deflect so that its upper end goes towards, say, the left of the observer. A current in the opposite direction produces a deflection towards the right. The left-hand position corresponds to the dot of the Morse code, and the right-hand position to the dash. The essential parts of this receiving instrument resemble very closely those of the vertical galvanometer itself. At the sending office two flat wooden keys, lying horizontally and side by side, have the necessary battery and line contacts, whereby either of these when tapped by the fingers of the operator sends a current to line of one direction or the other. Like the Morse printer, this needle-telegraph has the disadvantage that the operator must read the signals by eyesight, and also observe his own writing. To free him from this embarrassment, the needle is sometimes made to strike against small metallic plates, one towards each side of the dial: or, as in the double sounder, there are two horse-shoe electro-magnets on the left and right respectively of the operator, each having an ordinary sounder armature, from which, however, extends a 'hammer,' and by a suitable relay device these electro-magnets are actuated by the two-direction currents already described, so that the two signals shall be given by the hammers striking two corresponding metal plates, which differ from each other not only



Telegraphy—Diagrams of Apparatus.
(For explanation, see text.)

in position but also in the character of the sound thus produced.

To this class of signalling systems belong likewise the instruments for long submarine cables. In these cables, however, the signalling currents, even at low manual speeds, become retarded by Leyden-jar or condenser action arising between the line conductor and the conductors external to its insulating envelope; consequently these currents, although sent into the line quite distinct from each other, merge into each other ere they reach the receiving instrument, and are therefore quite unrecognizable at commercial speeds on instruments of the kinds already noticed. Besides, the high battery power required to work these might endanger the safety of the cable insulation. Lord Kelvin overcame both these drawbacks by the invention, first of the mirror galvanometer, and later of the siphon recorder, in both of which the sending arrangement is practically that of the single needle. From the to-and-fro movements of the spot of light on the scale the signals received on the mirror instrument are read. Fundamentally, the siphon recorder belongs to the D'Arsonval galvanometer order of apparatus, for its indications are due to the movements of a coil of wire (connected in the line circuit) suspended between the poles of a permanent magnet having more or less the horse-shoe form. Next, above the centre of a moving strip of paper is the lower end of a fine glass tube supplied with ink, which taps rapidly upon the paper, forming a succession of dots. To this tube an attachment is so made from the suspended coil that, when the coil rotates in one direction or the other (owing to the received signalling currents traversing it), the tube is moved from the centre towards one edge or the other of the strip of paper, thereby recording the signals of position as indicated in Fig. 8.

In systems of the alphabetic class the mechanical contrivances are often considerable in number and complex in use. They are either (a) non-recording, or (b) recording. In Britain the prevailing non-recording system is the Wheatstone ABC telegraph. Ranged concentrically round a circular horizontal dial stand a series of small metallic keys, each broadly corresponding to a letter, figure, or punctuation mark. This is the exterior of the sending portion, or 'communicator.' In the receiving instrument a pointer can rotate with a rapid step-by-step movement over the face of a dial having the letters, etc., printed towards its edge, from one letter to the

next being one step of the pointer. To send a message, the operator with his right hand turns a small handle to generate a regular succession of alternate currents from a magnet and coil arrangement, and each such current passing through the receiving instrument advances the pointer one step. The depression of any particular key by the sending operator cuts off the transmission of further currents until that key is raised.

In the recording class the Hughes instrument still occupies the premier position. On the short cables which connect Britain with the Continent it is the system almost exclusively used, and in France it is widely employed. A keyboard of the piano order contains keys corresponding to the letters, etc., and the depression of one of these causes a type-wheel at the distant office to record the letter, etc., on a strip of paper. The Hughes admits of duplex working. For short circuits of a certain class the United States has taken eagerly to the recording alphabetic telegraph, and the instrument popularly known as the 'ticker' renders important service in transmitting Stock Exchange quotations and news items. A new instrument, invented by Mr. Murray, is now being tried for high-speed work over long distances in Britain. In Austria the Pollak-Virag system is being tested. In this a telephone forms the galvanometer, and the movements of the diaphragm are shown by a mirror and a beam of light reflected on to a moving sheet of photographic paper.

Writing telegraphs and facsimile telegraphs have not yet come into anything like extended use. Their very low working speed, for one thing, tells strongly against them in competition with other systems. For the purely writing systems two line wires form part of the arrangement. The sender gives to a stylus the general movement peculiar to the formation of any written sign, and this causes corresponding variations of a special resistance system in each line circuit. The consequent variation of a permanently flowing current in each line circuit gives rise to a differential magnetic action at the receiving office, so that a writing pen, connected to the armature acted upon, executes quite the same movements, and thus records the sign upon a strip of paper passing beneath it. In Britain there has recently been introduced an instrument, called the telautograph, capable of transmitting in this manner not only writing, but also diagrams of limited size. This instrument is meant to give an

authoritative record on telephone circuits of transactions first arranged by verbal communication.

As a rule, facsimile systems—to transmit writing, diagrams, or pictures—are based on electrolysis. At the sending end a sheet of tinfoil contains the writing—or anything else for transmission—in insulating ink. This sheet lies round a rotating cylinder, over which rubs a metallic stylus connected to the line and connected also to one pole of a battery, the other pole of which makes connection through the cylinder with the tinfoil and earth. To receive the writing, etc., an earth-connected metallic cylinder carries a sheet of prepared paper, and upon this rotating cylinder rubs a metallic stylus connected with the line. Both cylinders rotate synchronously, and have a screw movement by which each stylus is made to traverse a close spiral path on the cylindrical surface. When, therefore, the sending stylus touches uncovered tinfoil, the battery is on a shunt circuit through the stylus and tinfoil, so that no effective current goes to line; but immediately the sending stylus gets upon the insulating ink, this shunt circuit ceases to exist, and the consequent line current through the damp receiving paper produces there a mark by electrolytic effect. This received writing consists of detached dots, in some cases only one dot being added to a line of writing with one revolution of the cylinders.

Line Construction.—Of line work there are two kinds, *open* and *covered*—the former seen as bare wire, of copper or iron, suspended from poles by the side of roads, canals, railways, etc., likewise from standards and attachments on the roofs of houses. The latter consists of wire insulated throughout its entire length by some insulating covering—usually gutta-percha, india-rubber, or (by a special arrangement) paper. Covered lines, usually called cables, may be slung through the air from point-to-point supports, buried underground in pipes, laid on the seabottom, or led through railway tunnels or other subways. To secure the insulation of an open line, the wire is bound at each point of support to an insulating substance of the requisite mechanical strength, and in the form of an inverted cup—in Britain generally porcelain or brown earthenware, glazed of course; but the drier atmosphere of the United States permits glass. Wooden poles, treated by some preservative process, are commonly provided; but in tropical countries, where

immunity from insect depredations is necessary, iron poles are used. Wooden poles frequently have an iron wire stapled to them from butt to above the 'roof,' with branches to the arms sustaining the insulators, for the twofold purpose of reducing the risk of pole destruction by lightning, and of carrying off to earth all the electricity that leaks from each wire, which leakage might find its way to the neighbouring wires on the arms. In covered lines the conductor is invariably copped of high conductivity.

Submarine Cables.—The great first cost, the risk of serious disablement after laying, and the earning power (with sufficiency of traffic), as determined by the signalling speed attainable, are in the case of long cables matters of the very highest importance. Mechanically, the cable must be adapted for laying, in the first instance; and for lifting from great ocean depths, should necessity arise for repair. Electrically there must be sought a low capacity, a low resistance, and a form of conductor in which the risk of complete severance from any cause shall be a minimum. Fig. 10 shows one of the most recent forms of submarine cable. Here *c* is the conductor for the passage of the signalling currents, consisting of a central heavy copper wire, having around it and in metallic contact with it a spiral layer of fine copper wires. Enveloping this conducting system is the insulating compound, *a*, called the dielectric, mainly gutta-percha. External to the dielectric lies a cushion of hemp, *b*, to prevent injury to *a*, during the application of the protecting sheathing, *d*, a layer of steel or iron wires laid on spirally. To protect the sheathing from corrosive action there is finally a covering of hemp coated with a composition of pitch mixed with sand, *e*. Fig. 10 represents a deep-sea cable section. Fig. 11 shows, for the same submarine cable, a mechanically stronger form to be used in shallower water. A still stronger form is used where the coast is being approached, and for the actual shore ends (Fig. 12) an extremely heavy armouring becomes necessary. In all these forms, in one cable, the conductor and dielectric, the 'electrical' portions, remain uniform throughout. Fig. 13 shows a section of the Anglo-Belgian cable.

Line Faults and Phenomena.—Telegraph line communication may be interrupted by faults classified as—(1) disconnection, (2) earth, (3) contact. In disconnection the continuity of the conductor has been broken. An earth fault exists where the wire makes contact with the ground,

or with some ordinary conductor resting on the ground, at some point intermediate between the extremities of the line. If two or more lines be in contact, the current sent on one line divides at the point of contact amongst all the lines in such a way as not only to reduce the received current on the original line, but to interfere with the signal currents proper to the other lines individually. Systematizing our testing, we can locate the fault to the one particular length of line in which it lies. In the case of open lines, the exact position of the fault is found by optical inspection. In underground work we find the actual distance of the fault from the end of the length by appropriate electrical tests. In submarine cables the distance localization is carried out from the extremities of the cables. In long cables this operation calls for great electrical skill, because the results of the observations obtained are often complicated, uncertain, and even in some respects contradictory of each other. Despite these drawbacks, it is not uncommon for faults on, say, an Atlantic cable to be localized to within a fraction of a mile of its true position.

Lightning striking open lines may fuse the wire or split poles. Passing from open work to underground or submarine lines, it may perforate the dielectric and thus earth the conductor. Entering offices by the line wires, it may injure the apparatus, fire the building, or endanger the person of the operator. Poles obtain protection from the pole earth-wire extending above the pole roof. Lightning protectors of special form are introduced on circuits where open work joins underground or submarine lines, and where lines enter offices. In one of its forms the protector consists of two circular brass plates facing each other, but kept from metallic contact by a perforated disc of mica. One plate is connected with the line wire and the other with the earth, so that the lightning coming from the open work prefers to spark to earth across the narrow air interval between the plates rather than proceed further along the circuit.

Occasionally lines having an earth return experience interference by currents passing through them from one earth extremity to the other, especially during displays of the aurora. This occurs in consequence of the telegraph wire acting as a derived circuit upon the earth's crust, through which currents are passing. Such currents in wires, known as 'earth currents,' when strong enough to interfere with signalling, can be avoided by the

use of a second wire for the return circuit, which gives a 'metallic circuit.' See Preece and Sive-wright's *Text-Book of Telegraphy* (new ed. 1905), Loring's *A Handbook of the Electro-Magnetic Telegraph* (1900), Herbert's *Telegraphy* (British Post Office System, 1905), and Bright's *Submarine Telegraphy* (1898).

Telegraphy, WIRELESS. See ELECTRO-MAGNETIC WAVES.

Telemachus, son of Odysseus by Penelope. After his father's absence had lasted twenty years, he went for tidings of him to Pylos and Sparta. Returning home, he found his father had come, and aided him to kill the suitors. He succeeded Odysseus as king of Ithaca. (See Homer's *Odyssey*.)

Telemeter. See RANGE-FINDERS.

Teleology signifies by derivation 'a doctrine of ends,' and as a philosophical term is used in connection with two special problems:—(1.) Is the conception of end required for the explanation of organic life; or is the organism simply a very complex mechanism? (2.) Is it permissible to interpret the world as a whole in terms of end as a purposive system? For the modern form of these problems, which are not of modern date, we may refer to Kant's *Critique of Judgment*. His answer to the first is rather complicated and difficult. On the one hand, he is quite convinced that living things will never be explained on merely mechanical principles. The organization which makes all the parts of a living thing the expression of the single life of the whole is incapable of such explanation. On the other hand, he had already shown, in his analysis of the principles of science in his *Critique of Pure Reason*, that all that happens, every event in nature, must come under the mechanical law of cause and effect, and it is impossible to except living beings from the range of this absolutely universal law of experience. His somewhat unsatisfactory solution is to maintain the teleological point of view as indispensable for our judgment, while denying to it any ultimate scientific necessity as regards the objects themselves. That is to say, we cannot help looking upon living things *as if* they were other than mere mechanisms; but we cannot affirm as a proposition of science that they are not mechanisms, nor can we withdraw them from the scope of mechanical law. The answer Kant gives to the second problem is similar in method, but turns this time on the difference between the scientific and the ethical point of view. We can-

not help thinking of the world, as a whole, as governed by the highest end we know—viz. the moral end. On the other hand, this teleological, or more definitely theological, conception of the world remains a practical postulate which conveys no scientific knowledge of the actual structure of the world; and the attempted argument from the actual structure of the world to a designing mind as its cause—the teleological proof of the existence of God—is condemned by Kant as invalid. For this rather tentative recognition of purpose in the world, as indicated by the facts of organic life and by the demands of our moral consciousness, Kant's idealistic successors, and especially Hegel, sought to substitute a conception of the world as through and through the expression of mind or reason. But the problems of teleology may be said to stand pretty much where Kant left them.

Teleosaurus, a fossil marine crocodile found in the Lower Cretaceous rocks of England. It had a very long, pointed snout, armed with many teeth, and its body was covered with bony, tuberculated plates firmly united by sutures.

Teleosteans, or TELEOSTEI. See BONY FISHES.

Telepathy. See PSYCHICAL RESEARCH.

Telephone Bells. See ELECTRIC BELLS.

Telephony, invented (1876) by Graham Bell, is the art of reproducing sounds at a distance by means of electricity. In its simplest form a telephone system consists of transmitter, line wires, and receiver, the two instruments being similar. A long horse-shoe magnet AA (Fig. 1), with a small extension piece of soft iron, F, at each end, is fixed very close to the centre of a disc of thin sheet iron D. The disc is clamped firmly round the edge, and the centre is attracted very slightly towards the poles of the magnet. A screw, S, permits of the adjustment of magnet and disc. Round each iron pole piece is placed a coil or bobbin of fine copper wire, B, the ends of which are joined to the two line wires, so that the coils of the two instruments and the line form a closed circuit (Fig. 2). When sound waves strike upon one of the discs they cause it to vibrate, approaching and receding from the magnet in consonance with the waves; and as the vibrations are very small and the disc has little tendency to continue vibrating by itself, the vibrations follow the sound waves in every change of pitch and quality. By this movement of the disc near

to the magnet poles the tendency of the magnetic lines of force to pass along the iron to the plate increases and diminishes periodically; and this change of magnetism in the iron cores produces electric currents in the coils, which change with similar period. Then currents flow along the line and round the coils of the second instrument or receiver. They produce magnetic effects on the magnet, increasing or decreasing its strength, and increasing or decreasing its attraction of the disc. Hence the disc vibrates in unison with the original vibrations of the disc in the transmitter, and a similar sound, though a feeble one, is produced. Since the whole energy is derived from the original sound waves, this arrangement only serves over short distances, for the obstructive action or electrical resistance of the line weakens the currents. A modern telephone, while retaining the magnetic receiver, employs Hughes's microphone for the transmitter.

Microphone.—If a small rod of carbon rests lightly on a block of carbon, the electrical resistance of the contact is fairly high, and is, moreover, susceptible to change when the rod vibrates. By connecting one pole of an electric battery to the rod, joining the block to the line wire, and the other wire line to the battery, a circuit will be formed in which the high-resistance contact will exert considerable control over the current. The rod and block vibrate when a sound strikes them, the resistance of the contact varies with the vibrations, and fluctuating currents pass to the receiver, which reproduces the sound. But if the line is long and of high resistance, the change produced by the contact will be relatively small and the effect will be feeble. Accordingly, the battery circuit (Fig. 3) is connected, not to the line wires, but to the primary coil of a small induction coil. The fluctuating currents produce corresponding currents in the secondary coil, but by making the secondary coil of many turns a higher electrical pressure is produced in it. The secondary is joined to the line wires, and sends currents to the receiver, its higher pressure being sufficient to overcome the resistance of great lengths of line. At the same time, the resistance of the battery circuit is kept small, so that the contact resistance exerts its full effect. In practice the microphone (Fig. 4) consists usually of a very thin sheet of carbon, M, clamped at the edges, to receive the vibrations; a thicker block behind it, K, corrugated at the back; and a number of small

pellets of carbon between the two. The pellets form a number of contacts, and are more or less tightly pressed together as the front disc vibrates to and fro. The current is led in from the battery to the front disc, passes through the pellets to the block at the back on to the induction coil, and back to the battery. A ring of flannel, F, between the discs forms the sides of the chamber in which the pellets lie, and the whole is enclosed in a metal and ebonite case with a mouth-piece, L, to collect the sound. Various forms of receivers are used, usually with a compact circular magnet (watch pattern), but all constructed on the same principle. A popular form of instrument for table use is shown in Fig. 5. The line wires are almost always made of copper. In towns they are placed underground for convenience. Large numbers, separated from one another by wrappings of paper, and enclosed in a lead tube, are laid in earthenware pipes from the subscribers' houses to the telephone exchange. For long distances overhead wires are necessary, for the groups of wires and lead sheath in close contiguity absorb the electricity by their electrostatic capacity and weaken the currents, while the isolated overhead wires show very little of this weakening effect.

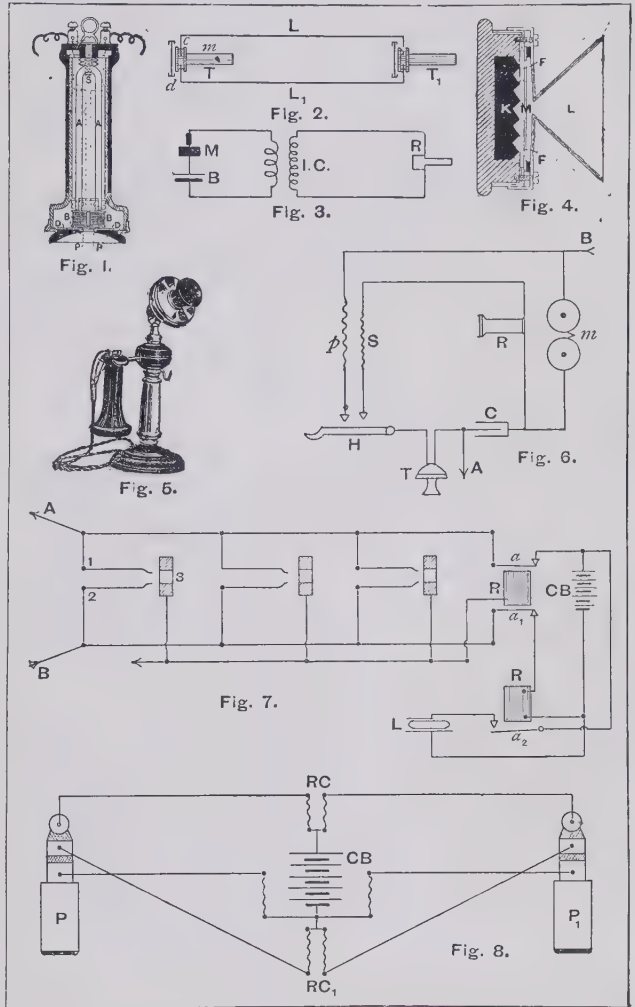
Telephone Systems.—For telephoning between two points a simple set, with transmitter, receiver, and call-bell, is sufficient. The same battery actuates both bell and microphone, and a switch and press-button permit of the call bell or transmitter and receiver being used, the instrument standing normally with the bell ready for action. The removal of the receiver for listening automatically cuts out the bell, and connects the microphone and receiver to the line. Where several places are required in connection, each set is connected by a wire to all the others. Thus, in a ten-point system ten wires enter each set, and are joined to the ten buttons of a selector switch, by which the particular point required is connected. A single wire serves for the return of the current, or the earth may be used. For the more complex town systems all subscribers are connected to a central exchange by separate wires, where each wire, passing through an indicator, which signals when a subscriber rings up the exchange, finishes at a small 'jack' or spring. The jacks are arranged in numbered rows on a board, and any two subscribers are put into communication by connecting their respective jacks with a flexible wire. But this

simple board only serves for a few hundred subscribers, since at most only four operators can work at once on it without confusion. The method usually adopted is known as the 'multiple board.' The subscribers are divided into groups of some two hundred, each group being attended to by an operator. In front of each operator is a panel containing the indicators of the two hundred only, but there are jacks for the whole number of subscribers, the subscribers' wire passing on from panel to panel. Thus, any subscriber can be connected on to any other. There are arrangements for testing whether the line of the subscriber to be called is already engaged, and for signalling the close of the message. For connecting different districts trunk wires are used between exchanges, which also come to jacks on each panel. The calling subscriber is then connected by a trunk wire to the other exchange, which connects on to the jack of the subscriber to be called.

It will be sufficient to describe one of the many systems in use, in which a single battery at the exchange operates all the microphones, and a single dynamo actuates all the bells. The latest pattern of a subscriber's complete telephone set is that designed for use with the common or central battery system. Fig. 6 illustrates such a set as used by the Post Office on their London telephone service, and which is also being introduced by the National Telephone Company, where they employ the common battery system. A and B are the two line wires connecting with the apparatus; *m*, the magneto call-bell, which is actuated by a magneto generator at the central exchange; C, a condenser for shutting off the continuous current from the central battery; R, the receiver; *p* and *s*, the primary and secondary circuits of the induction coil; and H, a hook upon which the receiver is suspended when idle, and which makes or breaks the circuit according as the receiver is suspended or released from the hook. One battery of suitable primary cells, but preferably accumulators, having an electromotive force of twenty-four volts, situated at the exchange, serves for all subscribers, whether for speaking or ringing, as well as for operating purposes, at the exchange. Normally—although all the subscribers' lines are joined across the common battery—no current can flow from it through the subscriber's bell circuits, owing to the presence of a condenser in series with the bell. This involves the employment of

a magneto generator, or dynamo, at the exchange for providing an alternating current wherewith to actuate the subscribers' bells through the condensers. One generator suffices for ringing all subscribers. From the generator terminals conductors are led to

This operation provides a path for the continuous current from the common battery, across the hook switch from the A line through the primary of the induction coil and the transmitter to the B line, and actuates a relay, or automatic switch, at the



Diagrams of Telephone System.

(For explanation, see text.)

all the operators' desks, upon which ringing-keys, or press-buttons, are tapped on to the generator leads, and by means of which any subscriber can be called at will. A subscriber, on the other hand, when desirous of calling the exchange, simply removes the receiver from its hook.

exchange, by which a small glow lamp is lighted up. The glowing of a lamp, one of which is included in the circuit of every subscriber, is an indication of a call from that particular subscriber. Fig. 7 illustrates a single pair of wires connected to three panels and the additional call

apparatus at the exchange. The switch-board is constructed in sections, on the multiple principle. The line wires are all fitted to the back of the switch-board, and each one is connected on to a switch-spring on every section of the board. These switch-springs, or spring-jacks, consist of three parts—(1) a long spring, (2) a short spring, and (3) a ring or bush which fits into the woodwork of the switch-board. The two springs are connected to the line wires, and the ring to a cut-off relay, R, and one pole of the common battery, CB. If the exchange provides for 5,000 subscribers, the switchboard would consist of 25 sections, on each of which the 5,000 lines would terminate on switch-springs, making a total of 125,000, but only 200 line wires would be provided with lamp indicators on each section. An additional 'home' switch-spring is inserted for each of the 200 lines so terminated, and is used by the operator for answering calls on these lines.

Fig. 8 shows the connections of the pegs by which subscribers are connected on the board. In the operator's equipment are included an answering peg P, and a calling peg P₁, each having three separate parts, insulated from one another, and designed to make contact with the three corresponding parts of the switch-springs. The tip and sleeve are connected through flexible conductors with the positive and negative poles of CB, while a third conductor connects with the bush, all three conductors being insulated and bound together in the form of a flexible cord. On inserting a peg into a switch-spring the tip makes contact with the A line through the short spring, (1) the sleeve with the B line through the long spring; (2) the bush with the cut-off relay, R, through the ring; and (3) when one subscriber desires to be put into communication with another, he simply removes the receiver from its hook—an operation which automatically provides a circuit for the current from CB, through the line wires and the line relay R₁. The latter is thereupon energized, its armature A₂ attracted, and its local circuit closed. The glowing of the lamp, L, situated in this local circuit is an indication of a call at the exchange. The operator, by inserting the answering peg P, completes a circuit from the positive pole of CB, through the cut-off relay R, the ring 3 and the bush of the peg, to the negative pole of CB. The armatures A and A₁ of R are thereby attracted, and the circuit through the line relay R being broken, the lamp is extinguished. On the calling sub-

scriber intimating the number of subscriber required, the operator makes a simple test to ascertain whether that line is engaged or not. If free, the calling peg P₁ is inserted in the required switch-spring, and that subscriber is called by means of the common magnet generator.

In both the answering and calling peg circuits are inserted 'clearing' relays and lamps, which are actuated on either the calling or the called subscriber restoring the receiver to its hook, thus indicating to the operator the conclusion of a conversation. In other systems each subscriber may have a hand dynamo for calling or ringing up, and a separate battery for working the microphone, or various modifications of detail may be employed. See Preece and Stubbs's *Telephony* (1893), Abbott's *Telephony* (1903), Herbert's *Telephone System of the British Post Office* (new ed. 1904), Webb's *The Telephone Service* (1904), and Poole's *Practical Telephony* (1905).

Telephus, a son of Hercules and Auge, daughter of the king of Tegea. Not knowing his parentage, he consulted the Delphic oracle, which sent him to Mysia, where he found his mother, and succeeded the king, Teuthras, on the throne. When the Greeks came to besiege Troy, he resisted their landing, and was wounded by Achilles. An oracle told him that his wound could only be cured by his assailant; so he went as a beggar to the Greek camp, and was cured by Achilles with the rust of his spear. He then showed the Greeks the road to Troy.

Telescope, an optical instrument by which remote objects are brought apparently nearer. There are two kinds of telescope: in one, the rays from the object are made to converge by refraction; in the other, by reflection. The refracting telescope, invented in 1608 by Hans Lippershey, a spectacle-maker at Middelburg in Holland, was employed from 1609 in celestial observations by Galileo, Simon Marius, and Thomas Harriot. As originally devised it was a monocular opera-glass, composed of a convex and a concave lens fitted at opposite ends of a tube. In its modern form the dioptric telescope, described by Kepler in 1611, was first constructed by Father Scheiner. It consists essentially of a large convex lens of long focus, and a smaller convex lens or eye-piece of short focus, with which the real image formed in the focal plane of the 'objective' is magnified. The two are fixed at a distance apart equal (approximately) to the sum of their focal lengths, the ratio between

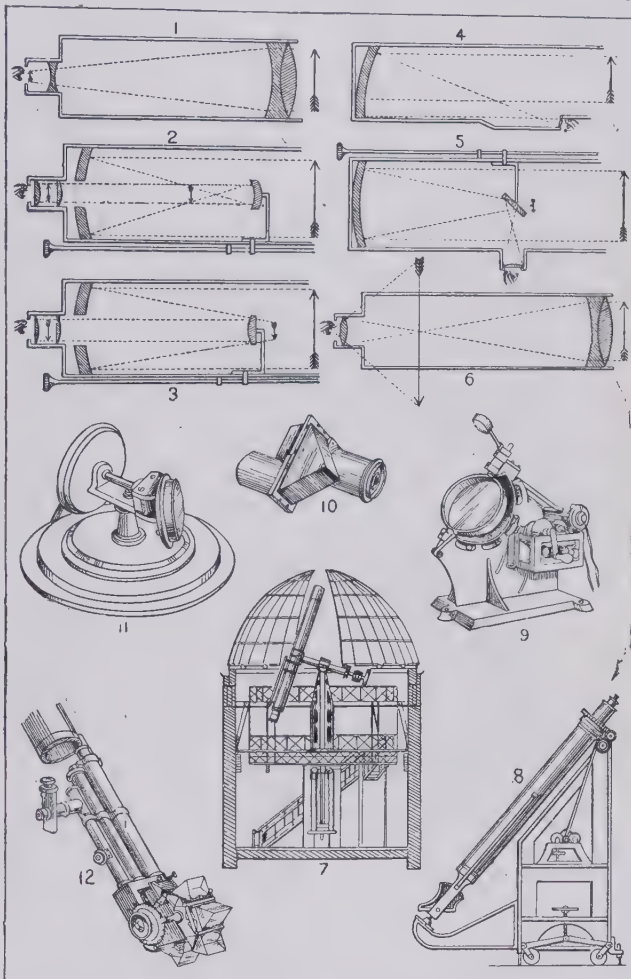
which gives the magnifying power of the combination. The images are seen inverted, and they are also rendered indistinct by the effects of spherical and chromatic aberration. For these last defects a partial remedy was provided by the use of 'aerial telescopes' of inordinately long focus and destitute of tubes. Huygens presented one of 123 ft. to the Royal Society of London, and Bradley measured the diameter of Venus, Dec. 27, 1722, with a tubeless instrument 212 ft. long. But the path of progress lay in a different direction. The invention of achromatic lenses, anticipated without being divulged by Chester Moor Hall of Essex, in 1733, was effectively realized by John Dollond in 1758. Owing to their unequal refrangibilities, the coloured rays forming white light come each to a separate focus when transmitted through a simple convex lens. They yield, accordingly, a blurred and tinted image. Dollond, however, discovered that one kind of glass can be made to neutralize the dispersion of another kind, while leaving a balance of refraction, and he constructed object-glasses of a convex crown fitted to a concave flint lens, by which the main part of the incident light was brought to a common focus. Moreover, by skillfully compensating the opposite errors due to the curvatures of the glass surfaces, he succeeded in correcting spherical aberration as well, and thus, in principle, created the modern refractor. The labours of Guinand (1745-1824) first made it possible to procure perfect discs of flint glass more than 3½ in. in diameter, and through his co-operation Fraunhofer was enabled to build the 9½-in. Dorpat equatorial (mounted 1824). The size of refractors was now continuously augmented. Two of 15 in. were sent by Merz and Mahler, Fraunhofer's successors, to Pulkowa and Harvard College, in 1840 and 1847 respectively. With an 18 in., by Alvan Clark of Boston, the satellite of Sirius was discovered in 1862; Cooke of York constructed a 25-in. equatorial for Mr. Newall in 1870; Clark, one of 26 in. for the Naval Observatory, Washington, in 1873; Grubb of Dublin completed the Vienna 27-in. refractor in 1881; and those mounted at Pulkowa and Nice in 1885-6 had each an aperture of 30 in. The superb Lick, 36 in., was finished by Clark in 1888; that of 40 in., for the Yerkes Observatory, in 1897. The achromatism of refractors is imperfect, and the outstanding colour or 'secondary spectrum' becomes more troublesome as aperture is increased. Its source is the chro-

matic 'irrationality' of flint and crown glass. The various colours are disproportionately deviated by the two media; consequently, only certain selected rays can be united by the compound lenses formed with them, the remainder showing as an obnoxious halo round the image. Experiments are being carried out with the view of overcoming this difficulty. Again, atmospheric disturbances impede the performance of large much more than of small refractors, while the percentage of incident light absorbed in them grows with the added thickness necessarily given to colossal lenses. Great telescopes, on the other hand, when employed under good conditions, possess immense advantages in the brilliant luminosity of the images afforded by them, and in their enhanced powers of penetrating space and resolving close objects like double stars. This last faculty depends upon the circumstance that the size of stellar diffraction discs bears an inverse relation to aperture. A photographic refractor has the object-glass so corrected as to unite the rays chemically most efficient. It is hence useless for eye observations. The eighteen telescopes with which the international survey of the heavens is being executed are of this type. The largest photographic refractor, so far constructed, is the Potsdam, 32 in. Others of 26 in. and 24 in. are mounted at Greenwich, the Cape, Meudon, and Arequipa (in Peru). Visual telescopes can also be adapted for photographic employment by placing a convex crown lens in front of the ordinary objective. That of the Lick telescope, for instance, is thus corrected at pleasure.

The reflecting telescope is of four varieties—the Gregorian, Cassegrainian, Newtonian, and Herschelian. James Gregory described the first in his *Optica Promota* (1663). It consists of two concave mirrors set face to face on the axis of an enclosing tube. The rays from the object, brought to a focus by the principal speculum, are thrown back by the small mirror through a central perforation in the large one into an eye-piece fixed in the aperture. As the result objects are viewed erect, and in the natural direction. To obtain theoretically perfect images, the primary and secondary mirrors should be, the one a paraboloid, the other an ellipsoid of revolution; but these arduous conditions are scarcely realizable. The famous reflectors made, 1732–68, by James Short of Edinburgh were of the Gregorian form. It is now virtually obsolete. The

Cassegrainian was a modification of it introduced by Cassegrain in 1672. The second reflection takes place here from a convex hyperbolic surface, whereby the focal length of the instrument is shortened by twice that of the small mirror. This construction

latter into an eye-piece placed at right angles to and near the top of the tube. The line of vision is accordingly perpendicular to the true direction of the object. The first specimen of the Herschelian or 'front-view' reflector was the 4-ft. telescope built by



Types of Telescopes.

1. Galilean telescope. 2. Gregorian. 3. Cassegrainian. 4. Herschelian. 5. Newtonian. 6. Ordinary refracting. 7. Section of Radcliffe Observatory, Oxford, showing hydraulic ram, elevating floor, and equatorial. 8. Siderostatic telescope and carriage for observer inside observatory while objective and mirror are outside. 9. Celeostat. 10. New form of terrestrial or erecting eye-piece. 11. Star position finder. 12. Spectroscope.

was employed by Thomas Grubb in the 4-ft. Melbourne telescope (1870). The Newtonian reflector, invented and exemplified by Isaac Newton in 1668, is still in general use. A small plane mirror, set at an angle of 45° to the axis of the principal speculum, reflects the rays focussed by the

William Herschel at Slough in 1789. He devised it for the purpose of economizing the light wasted by a second reflection. One speculum only is employed, and it is slightly tilted so as to form images, not at the centre but at the upper margin of the tube, where the eye-piece is in-

serted. The observer thus stands looking down into the tube with his back to the object. Good definition is scarcely compatible with this arrangement. The Rosse reflector, mounted as a Newtonian at Parsonstown in 1845, still holds the premiership for size. The mirror, which is 6 ft. in diameter, is of speculum metal, an alloy of copper and tin. This material has, however, been superseded since about 1870 by silvered glass, suggested as a substitute by Steinheil and Foucault in 1856-7. A glass disc, worked to figure, is coated by a chemical process with a film of metallic silver, which is extremely brilliant while fresh, and can easily be renewed when tarnished. The improvement was finely illustrated in Dr. Common's 36-in. Newtonian, completed in 1879, and transferred in 1895 to the Lick Observatory. A 5-ft. reflector, constructed by him on a similar plan, was purchased for the Harvard College Observatory in 1904.

For the uses of exact astronomy, the reflector is unrivalled. It is recommended by its superior stability, definition, and adaptability to all forms of measuring apparatus. Moreover, in certain branches of photographic investigation requiring an extensive field of view, such as the picturing of the Milky Way, the combination of lenses known as a 'photographic doublet' is alone available. But in most departments of astrophysical research the reflector has undeniable prerogatives. It is, to begin with, perfectly achromatic. Light of all wave-lengths is concentrated by specula at a single focus. This is of peculiar importance in spectroscopy. With a refractor, each prismatic section needs a fresh adjustment of the focus. Glass lenses, too, strongly absorb short wave-lengths, so that ultra-violet spectra can be photographed only by the aid of reflectors, in some cases, with the replacement by a suitable alloy for silver, which exercises an inconvenient selective absorption in very high spectral ranges. For observations of coloured objects, and in thermal measurements of every kind, reflectors are unmistakably preferable. They can, besides, owing to their achromatism, be constructed of relatively short focal length. The ratio of aperture to focus or 'angular aperture' is an element of primary importance in celestial photography. It rarely exceeds $\frac{1}{2}$ for ordinary objectives, whereas it may be raised to $\frac{1}{4}$ for specula. There results a stronger concentration of light, and brighter though smaller images readily impressed upon sensitive plates. The attendant disadvantage of

distortion at comparatively short distances from the centre of the field is not seriously prejudicial to certain kinds of work. Again, reflectors are cheaper to build and to mount than refractors. Further, the natural limit set to the size of refractors by the continually growing percentage of incident light lost in transmission through their lenses does not apply to reflectors. Reflective power per unit of area is the same for large as for small specula. Finally, the practical possibilities of development are in their favour. Professor Hale considers that the construction of an objective 5 ft. in diameter would strain the utmost resources of the glassmaker's and optician's art, while the material for a speculum of nearly $7\frac{1}{2}$ ft. was available in 1896, and suitable discs 9 ft. in diameter might now probably be secured. Lenses, or mirrors of long focus, fitted with slight tubes, and kept in a fixed, often a horizontal, position, have important advantages in many departments of solar investigation; and they are necessarily supplied with light by means of a celostat or some instrument of its type, as in the 'Snow' telescope on Mt. Wilson, California.

Telescopium, a small southern constellation, inserted by Lacaille in 1752 between Ara and Sagittarius. Alpha Telescopii is a helium star of 3.8 magnitude.

Telford, THOMAS (1757-1834), Scottish civil engineer, was born in Eskdale. In 1787 he was appointed county surveyor for Shropshire, and six years afterwards engineer for the Ellesmere Canal, connecting the Severn with the Mersey. His next work was the laying out of a system of main roads in the Highlands of Scotland, over 900 m. in all, the improvement of harbours at Wick, Aberdeen, Peterhead, Dundee, and Leith, and the construction of the Caledonian Canal. The Göta Canal in Sweden, the Menai Suspension Bridge, and the Clyde Bridge at Glasgow were others of his works. See *Life of Thomas Telford*, by himself (1838), and *Life of Telford*, by Smiles (1861).

Tell, WILLIAM, hero in Swiss legend. The earliest written version of the legend dates from 1470, the next is in a chronicle of 1482, by Melchior Russ, and a contemporary *Tellentied*. Thereafter it gets more definitely shaped in the chronicles of Etterlin (1507), Stumpf, and Tschudi (1560-72). The finishing touch was given it by J. von Müller (1752-1809). The kernel of the myth is that, refusing reverence to the dual hat of Austria set up (1307) in Altorf market-place, Tell was sentenced to death unless he

shot an apple placed on his son's head. This feat he accomplished. But confessing that a second arrow was kept in reserve for the Austrian bailiff, Tell was seized, to be taken to the tyrant's castle, but escaped. His shooting of the tyrant was the signal for a rising, resulting in Swiss confederation. The apple story is of very wide diffusion, appearing in an earlier Danish version, and figuring in 'Adam Bell and Clym of the Clough' in Percy's *Reliques*. See Huber's *Die Waldstätte, mit einem Anhang über Tell* (1861); Vischer's *Die Sage von der Befreiung der Waldstätte* (1867); Gisler's *Die Tellfrage* (1895); and Schiller's play *Wilhelm Tell*.

Tell. See ALGERIA and TUNIS.

Tell-el-Amarna, place on r. bk. of Nile, Middle Egypt, between Memphis and Thebes; has ruins of temple and palace, founded by Amenophis IV. In 1887-8 some three hundred clay tablets with cuneiform inscriptions were discovered, containing Egyptian correspondence with Babylonia, Assyria, and other Eastern nations. Flinders Petrie further explored the ruins in 1891-92. See Davies's *Rock Tombs of El-Amarna* (1903); Winkler's *Der Thontafelfund von El-Amarna* (1889-90); and *Keilinschriftliche Bibliothek*, vol. v. (1896).

Tell-el-Kebir, vil., N.E. Egypt, on Freshwater Canal, 18 m. E.S.E. of Zagazig; the scene of Sir Garnet Wolseley's victory over Arabi Pasha, Sept. 13, 1882.

Tellez, GABRIEL. See TIRSO DE MOLINA.

Tellicherry, seapt. tn. and munic., Malabar dist., Madras Presidency, India, 43 m. N.N.W. of Calicut. The town is beautifully situated upon a group of wooded hills. It has an old fort. Exports coffee, cardamoms, and sandalwood. Pop. (1901) 27,883.

Tell-loh. See BABYLONIA.

Tellurium, TE, 127.6, is a rare semi-metallic element of the sulphur group, and is chiefly found as a gold telluride, and in some copper ores. It is of grayish-white metallic appearance, of specific gravity 6.2; melts at 455° C. and boils at 1,390° C. It forms tellurides with hydrogen and the metals similar to the sulphides; but the tellurous and telluric acids, H₂TeO₃ and H₂TeO₄, differ from the corresponding sulphur compounds in being only very feebly acid.

Tellus. See GÆA.

Telpherage. See ELECTRIC TRACTION.

Telshi, or TELSZEI, tn., Kovno gov., W. Russia, 95 m. N. of Kovno city. On a hill in the middle of the town is an old convent. There are tanneries, breweries, and distilleries. Pop. (1901) 6,215.

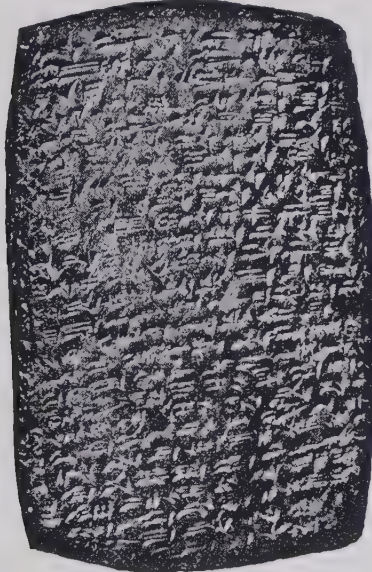
Telugu, a language of S. India, is spoken by 20,700,000 people. The area over which it is spoken extends from Orissa almost down to the city of Madras, besides being extensively used in the nizam's dominions and in the Central Provinces. Telugu, like all other languages of the Dravidian family, is an agglutinative language, particles being 'glued on' or prefixed, suffixed, or infixes, to words or roots in order to express grammatical relation. See Arden's *Telugu Grammar* (1873), Brown's *Telugu Grammar* (1857), Caldwell's *Comparative Grammar of the Dravidian Languages* (2nd ed. 1875).

Tembuland, one of the four

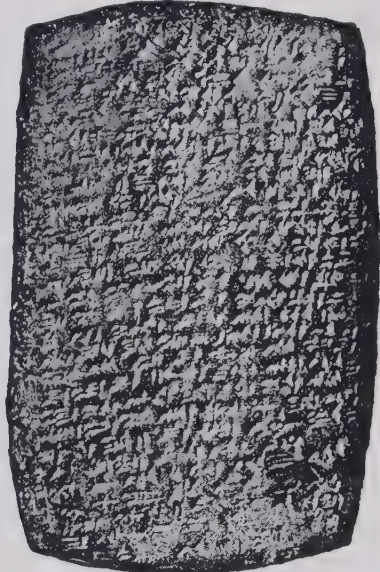
is the see of a Roman Catholic and of a Greek Orthodox bishop. Its castle was founded by Hunyady in 1443, and its Roman Catholic cathedral by Maria Theresa in 1736-57. Held by the Turks from 1552 to 1716, Temesvar was retaken by Prince Eugene. Pop. (1900) 53,033.

Tempe, a beautiful valley in N. Thessaly in Greece, between Mts. Pelion and Ossa, through which the river Peneus flows into the sea. Its scenery was so famous that the name became proverbial for a picturesque valley. It was also one of the chief passes into Greece, but its strategic value was diminished by the fact that it could easily be turned.

the varieties. The modern view rather is that the secretions of certain glands—thymus, thyroid, suprarenal capsules, etc.—and of various tissues have a direct effect in determining growth, quality of tissue, and generally all that constitutes temperament. This has been worked out by Tayler, who distinguishes the following types and details their physical and mental characteristics:—'scum' type; 'dreg' type; northern primitive long-limbed type; short-limbed southern type; mediæval type; scientific, metaphysical or rational, emotional, feminine and masculine types. These are exhibited in their evolutionary significance.



Obverse.



Reverse.

Clay Tablet from Tell-el-Amarna.

Inscribed with a letter from Abi-milki (Abimelech), governor of Tyre, to the king of Egypt, about B.C. 1450. (In the British Museum.)

administrative divisions of what formed Kaffraria, now comprised in Cape Colony, S.W. of Griqualand East; covers an area of 4,117 sq. m., and has a population (1904) of 231,150, of whom 8,057 are Europeans. Coal-mining is carried on. The capital, Umtata, is the seat of the Bishop of Kaffraria.

Temenos, a Greek word meaning an enclosed plot of land, and in its particular use the sacred precinct devoted to a god, which in earlier times contained nothing more than a sacred grove or an image, but in later days usually a temple.

Temesvar, fort. tn. and roy. free city, co. Temes, Hungary, 188 m. by rail S.E. of Budapest. It has manufactures of tobacco, cloth, paper, leather, and oil, and

Tempera, or FRESCO SECCO. See FRESCO and MURAL DECORATION.

Temperament is the predominant mental and physical cast or disposition that distinguishes one person from another. Each person is a compromise of characteristics; but the artistic may prevail in one, the scientific in another, the philosophic in a third. In the ancient pathology of Hippocrates the temperaments were—sanguine (based on the condition of the blood), phlegmatic (based on the predominance of the phlegm), choleric (predominance of yellow bile), melancholic (predominance of black bile). It is, however, evident that these classes are neither exclusive of one another nor exhaustive of

Temperaments thus become an important department of anthropology. See J. Lionel Tayler's *Aspects of Social Evolution* (1904).

Temperament, in music, is a term applied to the system of compromise adopted in the tuning of keyboard instruments. In natural or just intonation, intervals of tones are not all of equal size, and certain notes when sounded simultaneously must be slightly altered from their original pitch in relation to the tonic in order to produce perfect concords. Therefore, were an instrument of fixed pitch tuned to just intonation in any one key, it would not be absolutely in tune in all chords in that key, and would be much less in tune in any other key; but by temper-

ing all the intervals of a scale—with the exception of the octave—so as to deviate slightly from just intonation, a keyboard instrument can be made approximately in tune in all keys. By this method—termed 'equal temperament'—the octave is divided into twelve semitones of practically equal size, and this system of tuning is that which, from about the middle of the 19th century, has been universally adopted for the piano, organ, etc. The *mean-tone* system was that previously used, but instruments tuned to it could be played only in a limited number of keys.

Temperance and the Temperance Movement. The drunkenness of Noah was the first illustration of the evil action of alcohol; the histories of the Rechabites and the Nazirites clearly show the physical and spiritual advantages of abstinence therefrom. The pages of sacred and profane history prove that the ancient races of the world were very early addicted to distilled and fermented liquors. In Great Britain the first licensing act was passed in 1552. Tentative efforts to meet the evils arising from drunkenness had been made during the two previous centuries by lords of the manor and by justices, any two of whom had power to suppress 'useless alehouses.' In 1725 the Royal College of Surgeons petitioned Parliament to take some restrictive steps against the all-prevalent drinking habits of the people; and in 1750 the bishop of Worcester, preaching before the lord mayor of London, appealed to the citizens to concert measures for dealing with the drunkenness in their midst. In 1795 Dr. Benjamin Rush of Philadelphia published 'an inquiry into the effects of ardent spirits upon the human mind,' while in England in 1802 Dr. Erasmus Darwin and Dr. Thomas Beddoes and others gave their support to the movement against spirits. Gradually an organization into societies took place, the first being formed in America in 1826; within four years similar societies were found in Ireland, Scotland, and England. In 1832 began the advocacy of total abstinence from all kinds of alcoholic beverages. Its pioneers were Professor Edgar of Belfast, John Dunlop of Greenock, Joseph Livesey of Preston, and William Collins of Glasgow. When in 1846 the first World's Temperance Convention was held in London, the reports from all parts of Great Britain, the United States, and the British colonies indicated that the movement had laid hold of earnest and thoughtful people. The

304 delegates to the convention included such men as the Rev. Dr. Lyman Beecher (the father of Mrs. Stowe); Elihu Burritt, 'the learned blacksmith'; William Lloyd Garrison and Frederick Douglass, the anti-slavery advocates; and prominent among those actively at work in Great Britain, both in the press and on the platform, were Dr. F. R. Lees, James Silk Buckingham, James Teare, Thomas Whittaker, and John Cassell. A network of societies existed all over the kingdom, and in the United States and Canada, while those in Jersey, Rouen, and Havre indicated the spread of the movement across the English Channel. The existence of temperance friendly societies and of the first temperance life office showed that specializing in temperance work had already commenced.

The passing of a prohibitory act in the state of Maine led to the formation in Britain of the United Kingdom Alliance in 1853, and in the following year Lord Kinnaid and Forbes Mackenzie succeeded in passing a Sunday Closing Act for Scotland. A similar act for Ireland was passed in 1878, and one for Wales in 1881. In 1864 a Permissive Prohibitory Bill was introduced into the House of Commons, but it failed to obtain a second reading. Subsequent bills on the same subject have proved equally unsuccessful. The British colonies are far ahead of the mother country in respect to temperance legislation; the same may be said of the United States, with the distinction that something is wanting in regard to effective administration. Public opinion has but slowly developed in England. Much valuable work was done by the Lords' Committee on Intemperance, instigated by Convocation in 1876, and that presided over by Viscount Peel, which reported in 1899 in favour of a seven years' time limit to licences, with a *pro rata* commutation grant to dispossessed licencees during that period. The question of compensation has always been a hindrance to effective legislation, but any attempt to provide it out of public funds has met with strong opposition. The idea of compensating those whose licences were refused on the ground of not being required from funds raised from the trade itself has obtained public favour. The Conservative government of 1900 accordingly passed an act which came into force on Jan. 1, 1905, providing, *inter alia*, for the reduction of licences in proportion to the limits of a compensation fund raised from the trade on a rental valuation for the purpose.

Very early in the history of

the movement the training of children in the habits of abstinence was deemed important, and in 1847 an interesting development took place in the formation of 'Bands of Hope,' by the Rev. Jabez Tunncliffe of Leeds, and by Mrs. Carlile, an Irish lady. In 1855 the United Kingdom Band of Hope Union was formed, with a total of 16 societies; in 1905 it had in association 340 subordinate unions, with a membership of 3,018,567 boys and girls in 22,576 Bands of Hope. Other juvenile societies—e.g. the Young Abstiners' Union, intended for upper-class children—and junior friendly societies and orders, give an aggregate of 3,333,786 juvenile abstainers. Instruction is given in weekly Band of Hope meetings, and through the medium of teachers, who visit the primary schools throughout the country. This work was originated in 1863 by the National Temperance League (formed in 1856), and was taken up by the Band of Hope Unions in 1877. It soon spread to America, Canada, and the southern colonies, and then to the continent of Europe. A special committee of the British Medical Association (1904) recommended that compulsory instruction in hygiene and temperance be included in the school time-table.

As far back as 1804 Dr. Thomas Trotter, a naval medical officer, said, 'Beer was a poisonous beverage; wine strengthened neither body nor mind; the true place of strong drink was on the apothecary's shelf.' Declarations in this sense were signed by distinguished medical men in 1839, 1847, and 1871—e.g. Drs. Grindrod, Fothergill, and Higginbottom. Dr. F. R. Lees demonstrated that alcohol is a brain and nerve poison, that small doses have an appreciable toxic effect, and that it has no essential food value. This position was supported by Sir Benjamin Ward Richardson in 1874, and has been sustained by the British Medical Temperance Association, formed in 1863, and by the Society for the Study of Inebriety, founded by Dr. Norman Kerr in 1883. The experience of life-assurance offices is a standing argument in favour of the longevity of total abstainers, who have an advantage of 26 per cent. over the moderate drinker. At drawing-room meetings the moral and social claims of abstinence upon the individual were enforced by Samuel Bowly, president of the National Temperance League, W. S. Caine, and others. The Christian churches were influenced through the circulation in 1862 of 10,000 copies of *Haste to the Rescue*, and this resulted

in the formation of the Church of England Temperance Society. Considerable advance was made in the religious temperance movement through the labours of Archbishop Temple, Canon Ellison, Dr. Newman Hall, Charles Garrett, and Cardinal Manning. In 1860 organized temperance work in the army began, and in 1894 the National Temperance League, in conjunction with the Church of England Temperance Society, formed the Royal Army Temperance Association, which at home and in India has a membership of 56,000. In 1870 the first Royal Naval Temperance Society was formed by the men on H.M.S. *Reindeer*; to-day there is a branch society on every ship in his Majesty's commission. The formation in 1904 of an abstaining group in connection with the Trades Union Congress is significant. The progress of the movement has been materially assisted by great waves of enthusiasm arising from the labours of Father Mathew and John B. Gough, through whose advocacy and the Blue Ribbon movement of 1878-88 very large numbers were added to the ranks of total abstinence. The organized temperance propaganda has been sustained by the British, Scottish, Irish, North of England, and Western Temperance Leagues; the orders of the Rechabites, Sons of Temperance, Sons of the Phoenix, and Good Templars. The labours of the British Women's Temperance Association and of the Women's Total Abstinence Union have been among the most powerful in the cause of temperance. See Valpy French's *Nineteen Centuries of Drink* (1891); *The Temperance Histories*, by Burns (1889-90), Couling (1862), and Winskill (1890-2); Burns's *Temperance in the Victorian Age* (1897); Rowntree and Sherwell's *The Temperance Problem and Social Reform* (1900); Robinson Souttar's *Alcohol, its Place and Power in Legislation* (1904); F. R. Lees's *Select Works* (1884); B. W. Richardson's *The Action of Alcohol on the Mind* (1878), and *Recent Researches on Alcohol* (1878); Norman Kerr's *Inebriety* (1888); Sims Woodhead's *Recent Researches on the Action of Alcohol* (1903); Lacey's *The Case for Total Abstinence* (1890); Barrett's *The Truth about Intoxicating Drinks* (1899); W. N. Edwards's *Proving Our Case* (1905); T. P. Whittaker's *The Economic Aspect of the Drink Problem*; John Burns's *Labour and Drink*; the World's Temperance Congress Volume (1900).

Temperature, in physics, is that quality of bodies which depends upon the quantity of heat concentrated in them. We

are, in general, able to decide by sensation that one body is hotter or at a higher temperature than another, or by its shining more or less brightly when in the dark that it is at a very high temperature. But in order to get more exact and quantitative ideas of temperature other changes in the properties of bodies must be studied. Of these the change in size is most commonly made use of—most substances, whether solid, liquid, or gas, expanding when heated; and in the case of a gas, expanding almost exactly proportionally to the temperature over a very wide range. The expansion of a liquid such as mercury, though not so closely proportional to temperature, is, however, more convenient to apply, so that most thermometers depend on the measurement of the size of the particular quantity of this substance contained in them. The change of state of substances, as it takes place at definite temperatures, is also employed as a means of measurement. Thus the standard unit of temperature commonly employed is the range between the melting-point of ice and the boiling-point of water, this unit being divided into 100° in the centigrade and 180° on the Fahrenheit scale. Changes on heating in the electrical resistance of conductors, of electromotive force at the junctions of dissimilar metals, and of the colour and intensity of light emitted from a hot body, are also measured to determine temperature. See THERMOMETER and PYROMETER; also THERMODYNAMICS and GASES AND VAPOURS.

Temperature, in meteorology. The air receives from one-third to one-half of its heat directly by absorption, and the rest indirectly by conduction from the surface of the ground, after it has been heated by the sun. The atmosphere in contact with the earth becomes heated, expands, rises, and mixes with the cooler aerial strata above. The process by which this heating of the air is brought about is known as convection. At night the temperature of the earth and air is lowered by radiation, there being a constant interchange of heat between all bodies exposed to view of each other, thus tending to bring about a condition of equilibrium. This process commences at or shortly after sunset, reaches its maximum just at or slightly after sunrise, the reduction of temperature usually continuing until the dew-point is reached. The distribution of atmospheric temperature over the globe exhibits in the clearest manner the influence of conduction, convection, and radiation, as determined by the distribution of land and

water, prevailing winds, effect of forests, and the orographical features. These points are set forth with much elaboration in Dr. Buchan's classical monograph on 'Atmospheric Circulation' (*Report of the 'Challenger' Expedition, Physics and Chemistry*, vol. ii.). The maps show the results for the months of January and July: the lines showing the temperature are called 'isotherms,' or lines of equal heat, and are drawn for each 10°. These lines, it will be observed, are much more sinuous over the northern hemisphere in middle and high latitudes than over the southern. This circumstance is due to the uneven manner in which land and water are distributed, and to the influence of ocean currents. South of the line there is little land, so that the conserving influence exerted by the aqueous vapour of the air on its temperature is strikingly apparent. On the other hand, in winter the chilling influence of radiation, which takes place over the land masses of the Eurasian continent, is a marked feature, resulting in an exceedingly low temperature in eastern Siberia. In July, typical of the summer temperature distribution over the globe, conditions are much more equable, the southern winter being comparatively warm owing to the presence of the large oceans. Further, while winter in the northern hemisphere is characterized by severe cold, south of the equator a comparatively cool summer is experienced.

Interruptions of Temperature.—It has been found, on tabulating the mean temperature of each day of the year on a long series of years, that during certain well-defined periods the normal rise or fall of temperature is interrupted. Some of these periods, such as the cold spell, known in Scotland as the 'borrowing days' in April, are incorporated in popular weather lore, as is also the cold interval in May, designated the 'Ice Saint's festival.' The French proverb says, 'St. Mamertius, St. Pancras, and St. Gervais do not pass without a frost,' these being the respective saints' days for the 11th, 12th, and 13th of May. Dr. Buchan, who made an elaborate examination of the temperature of Scotland, found the following warm and cold periods, the recurrence of which takes place from year to year with considerable regularity.

Cold Periods.

7th to 10th February.
11th to 14th April.
9th to 14th May.
29th June to 4th July.
6th to 11th August.
6th to 12th November.

Warm Periods.

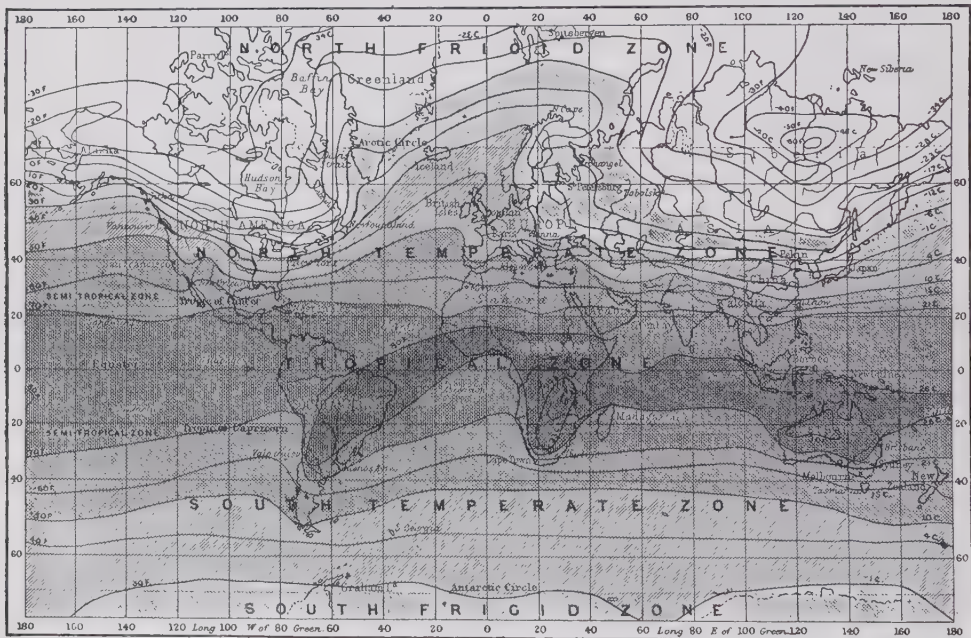
12th to 15th July.
12th to 15th August.
3rd to 9th December.

These interruptions of temperature have been found to be associated with the tendency for special types of pressure distribution to prevail at regular periods, causing a temporary increase in the frequency of polar winds during the cold spells, while in the warm periods winds from the south and west predominate. Observations for a hundred or more years at Paris, Vienna, Breslau, and Edinburgh show that these thermal anomalies are charac-

Payen and Godfrey de Saint Adhémar, with seven other knights, taking on themselves the solemn vows of chastity, poverty, and obedience, and undertaking the defence of pilgrims to the holy places from the attacks of the Saracens. By Baldwin II., king of Jerusalem, they were granted quarters in his palace, built on the site of the Temple; hence the name of the order. The rule of the order was severe and ascetic. It was drawn up for them by Bernard of Clairvaux. All luxury and display, even in armour, were forbidden, and all worldly pleasures, even hunting, were prohibited. At first none

pendent on the pope alone, and were allowed to confess to chaplains of their own order. Their houses had the right of sanctuary, and their property was exempt from taxation and tithing, and in consequence their establishments were frequently used as treasuries.

The active history of the Templars is the history of the crusades. To them rather than to the miscellaneous hordes that periodically swarmed from Europe was due the long stay given to the infidel. Twenty thousand Templars perished in the attempt to hold the holy place of the Christian religion for Christen-



Temperature Chart of the World—January.

teristic features of the daily temperature curves over western and north-western Europe. See Dr. Buchan's 'Interruptions in the Regular Rise and Fall of Temperature in the Course of the Year' (*Jour. Scot. Met. Soc.*, vol. ii.), and Hann's *Lehrbuch der Meteorologie* (1901). See also **HEAT** and **THERMODYNAMICS**.

Tempering is the working up and rendering homogeneous of such plastic materials as mortar, clay for bricks, etc. In large quantities this is done in some form of pug-mill. See **STEEL** (**TEMPERING OF**).

Templars, a military order, founded in 1119, at the time of the crusades, by Hugues de

but nobles or knights were admitted, but subordinate members were allowed for the menial work as the order grew great and wealthy. It was governed by a grand master, who had his seat, first at Jerusalem and then successively at Antioch, Acre, the Pilgrims' Castle (near Acre), and lastly at Limasol in Cyprus. The various provinces of the order—Jerusalem, Tripoli, Antioch, Portugal, Castile and Leon, Aragon, England, France, Aquitaine, Provence, Germany, Italy, and Sicily—were ruled by masters, grand priors, and commanders. In 1172 the Templars were set free from the jurisdiction of the bishops and made de-

dom, and most of their grand masters died on the field of honour or from wounds received in battle. They helped Richard Cœur de Lion to win the great victory at Arsuf in 1191, and from him they purchased the island of Cyprus. In the 13th century disaster followed disaster, till in 1291 Acre, after a memorable siege, was taken by the Saracens.

At last the enemies whom their arrogance provoked were not slow to bring against them charges of licentiousness, of apostasy from the Christian faith, of treachery to the crusaders, of oppression, and of extortion. For many of these charges there was probably some foundation in indi-

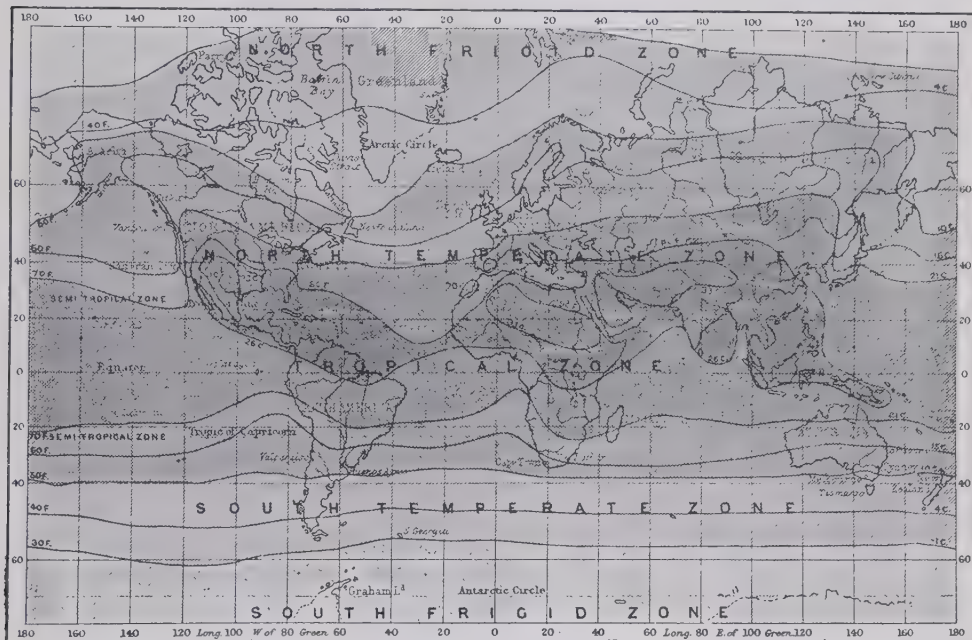
vidual cases; but the order itself remained Christian and orthodox. Philip of France, being in an impoverished condition, cast greedy eyes on the treasures possessed by the Templars, and directed the pope, Clement V., a creature of his own, to summon the grand master to appear before him. The grand master, Jacques de Molay, answered the summons, and on Oct. 17, 1307, he and 140 Templars were seized, and were thrown into prison. Torture was freely used to establish evidence. Many Templars were burned to death. Their property was confiscated and handed over to their bitter enemies, the Hospitaliers, with

income drawn from European sources alone is estimated to have been about six million pounds sterling. The Templars, moreover, possessed many privileges above ordinary Europeans. The manifest advantage of being a member of the order or one of its vassals soon led to abuses. Those who had no right to be so regarded fraudulently erected Temple crosses upon their buildings, and claimed the Temple privileges. The recognition as Templars of men who were under the ban of the church, or who had broken the laws of their country, must have tended greatly to increase the disfavour with which the order came to be re-

Schottmüller's *Der Untergang des Temppler-Ordens* (2 vols. 1887).

Template, or **TEMPLET**, the outline of something to be constructed, made in thin wood or metal, to serve as a pattern.

Temple. In the history of Israel three buildings of different eras bore the name Temple. (1.) Solomon's temple was one of a group of buildings on Mount Moriah (or Zion), the modern Haram-es-Sherif. Its artificers were Tyrian workmen, and it was probably constructed after Phœnician or Syrian models; compare, however, the arrangement of the tabernacle. Its various materials were dressed before they were brought to the site, Araunah's



Temperature Chart of the World—July.

whom they had been at open war in Palestine. The most shameful travesty of justice took place in France. In Spain, Portugal, and Germany the Templars were found innocent; and in England, where it required strong pressure from the pope to have them examined by torture, the charges broke down or were not pressed.

In addition to its possessions in Syria and Asia Minor, the order owned numerous lordships in almost every country of Europe—nine thousand manors, according to Matthew of Paris. Of these the memory still survives in many place-names incorporating the word 'Temple.' The annual

garded by all the nations of Europe. But the main cause of their overthrow was undoubtedly the dangerous position which they occupied in the political life of Europe.

The Knight Templars of Freemasonry, although a comparatively modern institution, represent a certain phase of the great historical organization, which was to some extent a secret fraternity. The societies of modern abstainers calling themselves 'Good Templars' have no historical basis. See Addison's *Knights Templars* (3rd ed. 1852); *Secret Societies of the Middle Ages* (1846); *Templaria* (1828-30); Froude's *Templars* (1886); and

threshing-floor. The main building was an oblong of sixty by twenty cubits, and thirty cubits in height (interior measure). Two-thirds of this space was separated from the remainder by a partition with curtained door: the former was the Holy Place, and contained the ten golden candlesticks and the altar of incense; while the latter, a cube of twenty cubits, was the Holy of Holies, in which was the ark with the cherubim. At the eastern end, farthest from the Holy of Holies, was the porch or chief entrance, with two pillars, Jachin and Boaz, each twenty-three cubits high. This inner temple was encased by three tiers of chambers, above

which were the windows of the main building, serving for ventilation rather than light. The ceiling of the large apartments was supported by pillars of cedar. The whole was surrounded by an inner court, containing the altar of burnt offering, the brazen sea, and ten brazen lavers, and was bounded by a palisade of cedar beams upon a stone base, and by a great court which enclosed not only the temple but the other royal buildings. The temple was pillaged and burned at the siege of Jerusalem under Nebuchadnezzar (588 B.C.), having stood for some 418 years. (2.) The Temple of Zerubbabel was founded 534 B.C., then compulsorily abandoned; resumed in 520, it was completed in 516. It stood on the site of the former, but was inferior both in magnitude and in splendour. It had several courts, with cloisters or cells for the priests. Desecrated by Antiochus Epiphanes in 168 B.C., it was repaired by Judas Maccabæus in 165. Pompey damaged it in 63 B.C., and Herod the Great inflicted further injury in 37 B.C. (3.) The Temple of Herod was begun about 20 B.C., and was built in one and a half years; but the edifice and outbuildings seem to have been under the workmen's hands till about 64 A.D. (cf. John 2:20). Herod chose a site adjoining the older building, and used some of its materials. This is the temple of the New Testament, associated with Jesus and His disciples. It was destroyed by fire in the siege of Jerusalem in 70 A.D. A splendid Mohammedan mosque now occupies its place. Ezekiel's temple (Ezek. 40-43) is an ideal construction. There was also a temple of the Samaritans on Mount Gerizim. See Josephus's *Antiquities*, xv. 11; Keil's *Biblical Archaeology* (trans. 1887); Benzinger's *Heb. Archæologie* (1894); Lewis's *Holy Places of Jerusalem* (1880).

Temple. See INNS OF COURT.

Temple, FREDERICK (1821-1902), archbishop of Canterbury, was born in the Ionian Is. At Oxford he took a 'double first,' and became fellow and tutor of Balliol College. Temple was appointed principal of Kneller Hall, Hounslow, and at the same time an inspector of schools. In 1858 he accepted the headmastership of Rugby, and during this period proved himself an ardent partisan of Gladstone. In 1867 he roused fierce opposition by his essay, 'The Education of the World,' published in *Essays and Reviews*. In 1869 he became bishop of Exeter, and in 1885 was appointed bishop of London. Temple, in 1896, succeeded Benson as archbishop of Canterbury, and proved himself a forceful

administrator. See *Memoirs of Archbishop Temple*, ed. by E. G. Sandford (2 vols. 1906), and F. I. Snell's *Early Associations of Archbishop Temple* (1904).

Temple, HENRY JOHN. See PALMERSTON.

Temple, SIR RICHARD (1826-1902), British Indian administrator, entered the Bengal civil service (1846), and became resident at Haidarabad, finance minister (1868), and governor-general of Bombay (1877-80). Especially notable were his services in the famine of 1874 and during the Afghan war (1878-80). Returning home (1880), he entered Parliament as a Conservative (1885-95).

Temple, RICHARD GRENVILLE, EARL (1711-79), British statesman, figuring in his time as 'Squire Gawkey,' was brother of George Grenville, and brother-in-law of the elder Pitt. First lord of the Admiralty (1756), he was (1757) dismissed by George II., who held him in aversion. He assisted Chatham financially, but quarrelled with him in 1766 over the Stamp Act. A patron of Wilkes, he has been held to be author of *Junius's Letters*.

Temple, SIR WILLIAM (1628-99), British diplomatist, born at London; became a member of the Irish Parliament in 1660. In 1665 he was appointed envoy at Brussels. His most famous work was the negotiation of the 'Triple Alliance' of 1668, between England, Holland, and Sweden, by which these states entered into a league for the protection of the Spanish Netherlands from France. Temple was afterwards appointed ambassador at the Hague, and, with the exception of the period (1671-4) of the Dutch war, remained there until 1679, during this time negotiating the treaty of Westminster, and the marriage of William of Orange with the Princess Mary. Temple passed the latter years of his life in retirement at Sheen and Moor Park, occupying his time with essay-writing and gardening. His essays were collected in two volumes of *Miscellanea*, the latter containing the famous essay on 'Ancient and Modern Learning.' He married Dorothy Osborne. He published also 2 vols. of *Memoirs*. See *Life and Works*, by Courtenay (1836), and *Love Letters of Dorothy Osborne*, ed. Gollancz (1903).

Temple Bar, the last of the old City of London barriers, was pulled down (1878) as an obstruction to traffic, and replaced by a monument bearing a device giving rise to the nickname of the 'griffin.' Temple Bar was built by Wren (1670). The closing of its gates announced the sovereign's entry into the city. It was

re-erected at Theobald's Park, near Waltham Cross, in 1888.

Templemore, tn., Co. Tipperary, Ireland, 9 m. N. of Thurles; has remains of a church and castle of the Knights Templars. It is a military station. Pop. (1901) 2,774.

Temple Society, a German religious community, founded in 1854 in Württemberg, which in 1868 emigrated to the Holy Land, where settlements have been made at Haifa, Jaffa, Saron, and in the vicinity of Jerusalem. There the community waits for the expected advent of Christ. It is composed of industrious agriculturists.

Temporal Power. See PAPACY.

Temps, LE, the leading organ of the moderate Republican party in France, was founded in 1861 by Auguste Nefftzer, who conducted the journal until 1871. He showed considerable enterprise in organizing foreign correspondence, and he made literary criticism another feature of *Le Temps*. Liberal in politics, the paper opposed the second empire; but it was suspected of Orleanist sympathies. In the last days of the empire it became popular, by virtue of the spirit which Jules Ferry and Henri Brisson imparted to its politics. *Le Temps* strongly denounced the *plébiscite* resorted to by Napoleon III. and the declaration of war with Prussia in 1870; and on the fall of the empire it gave its support to the moderate Republican party. Under the direction of M. Hébrard (from 1871) *Le Temps* became one of the most influential papers in France. Since 1870 its political articles have been anonymous.

Tempsford, vil., Bedfordshire, England, 9 m. N.E. of Bedford. It was burnt by the Danes in 1010 A.D. Near the Ouse is an ancient intrenchment probably of Danish origin, and another, known as Gannock's Castle, near the Ivel.

Ten, THE COUNCIL OF, a magistracy first appointed in 1310 by the Venetians to act as a more prompt and secret executive in affairs of emergency than could the larger bodies already constituted. It gradually absorbed all private and urgent executive business—foreign policy, censorship of morals, and trial of state cases. Its mysterious secrecy of procedure and its ruthless promptitude made it a terror to all offenders. It originally consisted of seventeen members—the doge, his six counselors, and ten annually elected members. In the 16th century a *giunta* of prominent members of the councils of state was added to it, and its jurisdiction in treason cases was delegated to three 'inquisitors of state.'

Tenacity, in strength of materials, is the least longitudinal pull which will cause a bar of unit section to rupture. It is commonly estimated in tons per square inch or kilograms per square centimetre. Its value varies much according to the material, and even in different specimens of the same material the tenacity has different values. This can be ascertained only by direct experiment. See ELASTICITY and STRENGTH OF MATERIALS.

Tenant. See LANDLORD AND TENANT.

Tenant-right. See AGRICULTURAL HOLDINGS ACT, and IRELAND.

Tenants in Common. If A, B, and C are together entitled to a piece of land in any proportions, but the land is undivided, they are said to be tenants in common. The position of tenants in common is distinguished from that of joint tenants by the fact that if, for example, B dies, his share passes to his heirs or devisees; whereas, if he was a joint tenant it would pass to A and C. During the tenancy in common, A, B, and C are entitled to the rents and profits in proportion to their shares. The tenure is very inconvenient, and is generally terminated by partition.

Tenasserim. (1.) Town, Mergui dist., Lower Burma, 33 m. from the mouth of the Tenasserim. Pop. (1901) 9,000. (2.) Division, an elongated strip of territory lying between the Indian Ocean and the mountains of the Siamese frontier. Area, 36,730 sq. m. Pop. (1901) 1,137,776.

Ten Brink. See BRINK.

Tenbury, tn., Worcestershire, England, on r. bk. of Teme, 20 m. N.W. of Worcester; has trade in hops, fruit, cider, and mineral water. Here is St. Michael's College. Pop. (1901) 4,838.

Tenby, munic. bor. and wat.-pl., Pembrokeshire, S. Wales, on W. side of Carmarthen Bay, 3 m. E. of Pembroke. Among its buildings are the church of St. Mary and the ancient walls and castle. Pop. (1901) 4,400.



Tench.

Tench (*Tinca vulgaris*), a freshwater fish of the carp family, found all over Europe in standing water, especially where the bottom is muddy. The scales are small and the skin thick; there is a pair of barbules; the

lateral line is complete, and the tail-fin is slightly emarginate. Tench always keep near the bottom, and bury themselves in the mud on the approach of winter. They are exceedingly prolific, and are sufficiently hardy to tolerate transport. Tench attain a weight of from four to five pounds.

Tencin, MADAME DE, or more fully CLAUDINE ALEXANDRINE, MARQUISE DE TENCIN (1681-1749), French writer, was born at Grenoble, and early joined a religious community. Finding this not to her taste, she came to Paris in 1714, and speedily attracted attention by her personal fascination and wit. The regent and Cardinal Dubois were among her many lovers. Like other women of the day, she dabbled in politics. In 1726 she was in the Bastille, as the result of a scandal. She was the mother of D'Alembert. Her *salon* was very popular, and she was authoress of several romances (e.g. *Mémoires du Comte des Cumminges*, 1735, and *Le Siège de Calais*, 1739). Her *Correspondance* was published in 1790, and *Lettres au Duc de Richelieu* in 1806. See Barthélemy, *Mémoires Secrets de Madame de Tencin* (1790).

Tenda, COL DE, Alpine pass (6,145 ft.) between the snowy Alps on the W. and the snowless Apennines on the E. It leads from Cuneo in Piedmont to Tenda at the head of the Roja valley, and is traversed by a carriage road, while a railway tunnel is being pierced beneath it.

Tender, an offer by a debtor to pay a debt. It must be physical—i.e. the debtor must produce the money to the creditor. The exact sum must be tendered, or if more than the exact sum is tendered, the debtor must not ask for change. Tender is a good defence to an action for debt—i.e. the creditor will get the amount of his debt, but without interest, from the date of the tender, and probably without costs. By the Coinage Act, 1870, all tenders must be made in legal coin, not recalled by proclamation. Gold is a good tender for any amount, silver for forty shillings, and bronze for one shilling. Bank of England notes are good tender, except by the bank, for sums above £5. A defendant who alleges tender must pay the amount tendered into court.

Tendon of Achilles, the tendon which connects the heel with the calf of the leg, and is the principal extensor of the foot. It is so called because, according to fable, the mother of Achilles, when she dipped him in the river Styx to make him invulnerable, held him by the heel, and thus the heel was the only part of him which remained vulnerable.

Tendons, in anatomy, are white, glistening, non-elastic cords, composed of white fibrous tissue, the fibrils of which are parallel and firmly united together. They are almost devoid of blood-vessels and nerves, but are sometimes provided with synovial sheaths. In certain tendons are developed sesamoid bones, of which the knee-cap is an example. Tendons serve as connecting bands between muscles and the structures upon which the muscles act. They are liable to sprain, and are the seat of inflammatory affections.

Tendrils, the name given to leaf-stalks which are so modified as to form twisting threads whereby certain plants cling to other plants or to supports. In some plants, tendrils are formed by the abortion of the leaf-blades; in others, by the extension of the leaf-stalks beyond the blades; and in others, by the modification of the leaf-blades themselves.

Tenedos, isl. in Ægean Sea, off coast of Troas in Asia Minor, the station of the Greek fleet during the siege of Troy. In later times it was famous for its wine and its pottery.

Tenerife, or TENERIFFE, PEAK OF (*Pico de Tejde*), a dormant volcano, island of Tenerife, forming the highest summit (12,180 ft.) in the Canary Is. The summit is snow clad. The last outbreak was in 1798; and in the year following Humboldt and Bonpland made their famous ascent. The island is treated under CANARY ISLANDS. See C. Piazzi Smyth's *Teneriffe* (1858).

Teneriffe Wines. See CANARY WINE.

Tengri Khan. See KHAN-TENGRI.

Teng-yueh. See MOMEIN.

Teniers, DAVID, the elder (1582-1649), Flemish genre and landscape painter, was born at Antwerp, and studied under Rubens. His works, somewhat fantastic in tone, as suited the taste of the period, are to be found in the Vienna, Berlin, Dresden, and Darmstadt galleries.

Teniers, DAVID, the younger (1610-90), the foremost Flemish genre painter of peasant life, of the alehouse and the card table, son of David Teniers the elder (1582-1649), who was his first master. Influenced by Brouwer and Rubens, he married the latter's ward, daughter of Jan (Velvet) Breughel. He was appointed painter to the Archduke Leopold-William, and in 1644 president of the Antwerp Guild of Painters. His paintings—delicately balanced, harmonious in colour, humorous, masterly in technique—are well represented in Buckingham Palace and the National Gallery.

Tenison, THOMAS (1636-1715), archbishop of Canterbury, was born at Cottenham. For some years a parish priest, Tenison became celebrated for his able religious and political controversies,

Ten Kate, JAN JACOB LODEWIJK (1819-89), Dutch man of letters, was born at the Hague. He became pastor at Middelburg and Amsterdam (1860). As a poet he produced some works remark-

ledge of Hebrew, Arabic, and Persian gained (1834) for him the chair of Oriental languages at St. Andrews University. His *Anster Fair* introduced to England the form of verse used by



Peak of Tenerife.

(Photo by the Photochrom Co.)

as well as for his powerful preaching. He became (1691) bishop of Lincoln, and four years later archbishop of Canterbury. He enjoyed the marked favour of William and Mary.

Ten Jurisdictions, LEAGUE OF THE, the third and youngest of

able for fancy and force. Among these are *De Schepping* (*The Creation*, 1866); *De Plancten* (*The Planets*, 1869); *De Jaargetijden* (*The Seasons*, 1871). He made felicitous translations of Tasso, Andersen, Dante, Schiller, Victor Hugo, Milton, Tennyson,

some Italian poets. Among his other writings are *Cardinal Beaton* (1823) and *The Thane of Fife* (1822).

Tennemann, WILHELM GOTTLIEB (1761-1819), German historian of philosophy, was born near Weimar. His principal work is *Geschichte der Philosophie*, in 11 vols. (1798-1819), written from the Kantian standpoint. He lectured at Jena (from 1788), and was professor of philosophy at Marburg (1804). He also translated into German the philosophical works of Locke and Hume.

Tennent, SIR JAMES EMERSON (1804-69), Irish author and politician, born at Belfast. In 1832 he was elected M.P. for Belfast, and was secretary to the Indian Board (1841-3), the Ceylon government (1845-50), and the Board of Trade (1852-67). He wrote *A Treatise on the Copyright of Designs* (1841), and *Ceylon* (1859; 5th ed. 1860).

Tennessee. (1.) One of the central states, U.S.A., with an area of 42,050 sq. m. It was admitted to the union in 1796. The surface of the w. portion is undulating, rising toward the E. part into the deeply dissected Cumberland plateau. From the E. escarpment of this plateau stretches the broad and fertile valley of E. Tennessee, drained



Tennessee.

the Three Leagues of Rhætia or the Grisons, Switzerland. It was formed (June 8, 1436) on the death of Frederick, last count of Toggenburg.

Tenkasi, tn., Tinnevely dist., Madras Presidency, India, 30 m. N.W. of Tinnevely; possesses a temple of great sanctity.

and Longfellow. His complete poetic works are published in 12 vols. (1890-1).

Tennant, WILLIAM (1784-1848), Scottish poet, was born a cripple at Anstruther, in Fife. He became a clerk, and later schoolmaster at Dunino, Lasswade, and Dollar. Tennant's know-

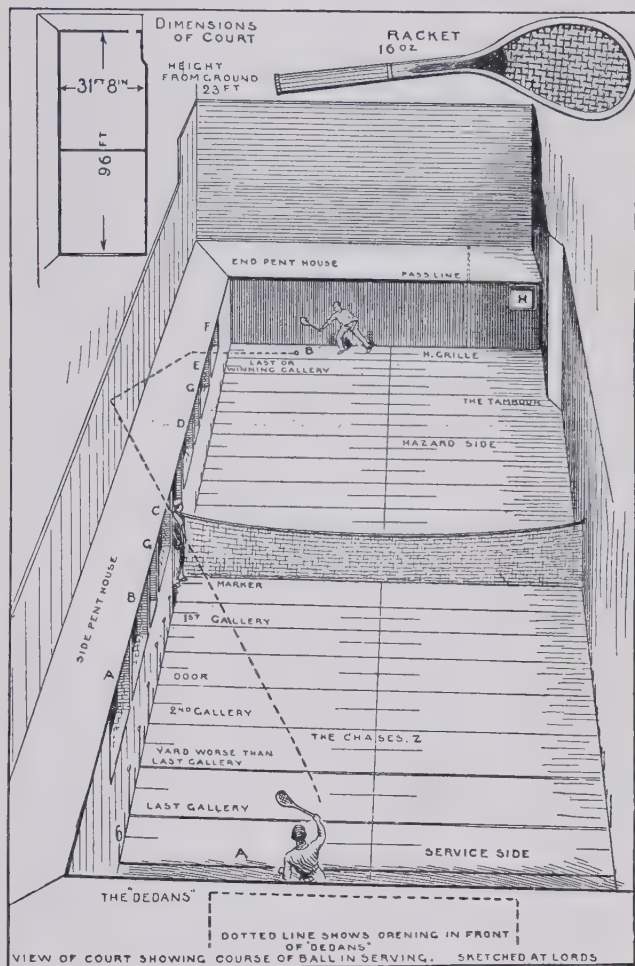
by the Tennessee R. On the E. of this valley rises the Great Smoky Range, 6,000 ft. or more in elevation. The Cumberland, rising in Kentucky, also flows through the state. The Mississippi flows along the W. boundary. The plateaus and the slopes of the Great Smoky Mts. are forested; elsewhere the forests have been largely cut away. The capital is Nashville. Memphis, on the Mississippi, is an important river port and railway centre. The industries of the state are, in a great measure, agricultural. The principal crops are tobacco, cotton, Indian corn, wheat, oats. The leading manufactured products are flour, lumber, iron and steel, textiles. Iron ore and coal are obtained mainly in the eastern part of the state. The population in 1900 was 2,020,616, of whom 50.5 per cent. were males and 49.5 per cent. females. Negroes formed 23.8 per cent.

(2.) River, U.S.A., the largest branch of the Ohio. It rises in the Appalachian valley in S.W. Virginia, and in the mountains of N. Carolina, in a number of branches—the Holston, Clinch, Powell, French Broad, and Little Tennessee—flows S.W. through Tennessee into Alabama, where it turns to the N.W., then N., flowing across Tennessee and Kentucky to its mouth in the W. part of the state at Paducah. It is navigable to Knoxville, the only serious obstacle being Mussel Shoals in N. Alabama, which have been improved by dams and slack water navigation. The drainage basin is 43,897 sq. m., and the length, from its mouth to the junction of the Holston and French Broad rivers, just above Knoxville, is 639 m. The total length of the river, following up the Holston to its source, is 1,200 m.

Tenniel, SIR JOHN (1820), English artist and cartoonist, was born at London. He joined the staff of *Punch* in 1851. His style was severely classical. He was first known as the winner of the prize for an allegorical drawing of *Justice* for the houses of Parliament, and as the painter of a statuesque *Adam and Eve*, exhibited in the Royal Academy. He soon, however, fell in with the humour of *Punch*, and the history of the last half of the 19th century may be gathered from the inimitable blend of serious purpose with kindly satire by which he almost always threw fresh light upon the political situation of the day. Some of Sir John Tenniel's best work is to be found in his delightful illustrations of Lewis Carroll's *Alice in Wonderland* and *Behind the Looking-Glass*. He was knighted in 1893.

Tennis, a game played by two or four persons, who hit a ball with rackets to and fro over a net stretched across the centre of a covered court. It is one of the oldest of all games of ball, being known since the 13th century. In the 17th century courts were very numerous; in Paris alone, in 1657, there were 114.

was considered to confer amateur championship on the winner. In 1899 the Queen's Club championship was thrown open to all amateurs, and since then its winners have been vested with the title of amateur champion. Amateur champions:—J. M. Heathcote (1867-81, 1883, 1886); Hon. A. Lyttleton (1882, 1884,



The Game of Tennis.

England possessed less than 20; in 1901 she has well over 30; while in the whole of France there are probably not 10. The best-known British courts are those at Queen's and Prince's Clubs, at Lord's, and at Hampton Court—the oldest in the country. From 1867 to 1888 inclusive, the Marylebone Club's gold prize (open to members only) at Lord's

1885, 1887, 1888); Sir E. Grey (1889, 1891, 1895, 1896, 1898); E. B. Curtis (1890); H. E. Crawley (1892-4); J. B. Gribble (1897); E. H. Miles (1899-1902, 1905-6); V. H. Pennell (1903-4). Professional champions:—P. Cox (British), 1819-29; E. Barre (French), 1829-62; E. Tomkins (British), 1862-7; G. Lambert (British), 1871-85; T. Pettitt (a British-

born American), 1835-90; C. Saunders (British), 1890-5; P. Latham (British), 1895-1904; Fairs (1905-6).

Tennis Courts.—These vary slightly in size, but the dimensions of the one shown in the diagram may be taken as a fair guide. The net is 3 ft. high in the centre and 5 ft. at the ends. The galleries are lettered A, B, C, D, E, F, and G (the doors); E, on the 'hazard side,' is the 'winning-gallery.' Both galleries and dedans have netting at the back and sides. The balls are from 2½ to 2⅝ in. in diameter, and from 2½ to 2½ oz. in weight. The bats are heavy, and not restricted in size or shape.

The Play.—In the following description, A and B are opponents. A is serving; he can stand in any part of the service-side. B stands in the hazard-side. A tosses the ball in the air, and hits it in such a direction that it touches the roof of the service-penthouse before touching any other part of the court except the service-wall or the rest of the side-penthouse. The ball must eventually drop in the service-court. If A fails to do this, it is a 'fault'; two consecutive faults count as a stroke to B—i.e. the scores become 0-15, the scoring being as in lawn tennis. B cannot take a fault; but if the ball is correctly served it is 'in-play,' and B returns it by hitting it over the net with his racket before it 'falls' (i.e. touches the floor a second time). A then returns it over the net, and so on alternately. When one of them hits the ball into the net or 'out of court,' the other scores a stroke. ('Out of court' is any part of the court above the 'play-line.') The ball may be hit at any time in its flight so long as it is prevented from 'falling.' Suppose B returns the ball over the net, and it runs along the side-penthouse roof, ricochets off the service-wall on to the dedans penthouse, and then drops on the floor: A must then hit it before it 'falls.' If he allows it to bound on the floor a second time (at a spot z), B is said to have made a 'chase.' The farther z is from the net, the more valuable the chase. Suppose z to be between the line marked 'door' on the floor and 2nd gallery, it is called 'worse-than-2nd-gallery.' Similarly, A may make a chase, but in his case z must not be between the service-line and the grille-wall. B's chase (we will suppose it to be 'better-than-3') does not count in the score yet. When A or B has scored 40, or when two chases have been made, the players change courts. Their respective scores still stand; but B now serves, and his chase has to be played for. A's object is

to make a better one, B's to prevent him from doing so (B is said to be 'defending his chase'—e.g. 'worse-than-2nd-gallery'); he wins the chase and scores a stroke. If A makes a worse chase (e.g. 'better-than-door'), B wins the chase and scores a stroke; if A makes a chase neither better nor worse, B's chase is annulled. When two chases have been made, each is played for separately. Chases are also made by hitting the ball into the various galleries, except the 'winning-gallery.' A player who hits the ball into the grille, dedans, or winning-gallery, scores a stroke at all times, and wins a chase if one has been made.

See *Tennis, Rackets, and Fives* (All England Series), by Julian Marshall and J. A. Tait (1890); and *Tennis* (Badminton Library), by J. M. Heathcote (new ed. 1903).

Tennyson, ALFRED, LORD (1809-92), English poet, was born at Somersby in Lincolnshire. In 1826 he and his brother Charles produced *Poems by Two Brothers* (1827). We may hope that they were mainly by Charles. They were thought too much out of the common for the public taste. In 1828 he wrote most of *The Lover's Tale*, altered and published later. There are traces of the influence of Shelley, we might say; but Tennyson had not yet read Shelley. He went to Trinity College, and in 1829 won the university prize for a poem on *Timbuctoo*. At Cambridge, Tennyson was one of 'the Apostles,' with his friend Arthur Hallam (son of the historian), Thackeray, Monckton Milnes, Spedding, Buller, Trench (Archbishop), and others. In 1830 he published a slim volume of verses, several of which are worthy of his genius. 'The Mystic' touches on psychological experience of a trance-like or ecstatic kind, which continued through his life, and affected his poetry and philosophy. In 1830, Tennyson, with Arthur Hallam, visited the Pyrenees, which inspired his *Enone*. In 1833 appeared his next volume of poems, combining high performance and promise with a few puerilities and affectations. On these faults J. G. Lockhart wrote an amusing article in the *Quarterly Review*. Tennyson was hurt, but later removed all the blemishes relentlessly pointed out by 'the Scorpion,' who, for his part, repented, and in 1842 gave Tennyson's two volumes for criticism in *The Quarterly Review* to the author's friend, Sterling. Tennyson went on working at his perfect *Morte d'Arthur*; but on Sept. 15, 1833, his friend Hallam died at Vienna. The shock was cruel, but the poet met it with the resolute heart of

his *Ulysses*, composed about this time. In 1842 he published the two volumes, which he certainly never excelled—never again equalled, thought his old Cambridge friend, Fitzgerald. Their extraordinary and original beauty is only equalled by their unexampled variety of tone, topic, and treatment. Tennyson's success was secured; but as far as pecuniary profit went, it seemed a mere *succès d'estime*. In 1845 Milnes suggested to Sir Robert Peel that Tennyson should have a pension, and the state conferred on him £200 annually. *The Princess*, his next poem, was not very popular. It is a beautiful and dreamy fantasy, the dead mediæval world meeting with the world of 1847, and that world merging into another dream of the future. In May 1850 *In Memoriam* was published anonymously—the record of the three years of sorrow, doubt, and hope that followed the death of Arthur Hallam. The passages in which the poet's Two Voices dispute within him about evolution and immortality were written some twenty years before Darwin's *Origin of Species* appeared, and before Robert Chambers's *Vestiges of Creation* made the theory of development a topic in circles which like popular science. *In Memoriam* is not a philosophical treatise, it is not a system of belief: it is a poem. The soul of every mourner may walk with the poet's in the *via dolorosa*, comforted by the charmed beauty and by the sympathy of this greater sufferer. In 1850 Tennyson was appointed poet laureate, in succession to Wordsworth, and soon after published *Ode on the Death of the Duke of Wellington*. In 1854 he composed *Maud*, a poem which contains songs and lyrics of supreme beauty. *Maud* was the butt of the reviewers, but probably it was, in a pecuniary sense, the most profitable of his books up to this date. He bought some land at Farringford, in the Isle of Wight, and there made his home.

Tennyson now began to return to the subjects from the Arthurian romances, which had fascinated him ever since he wrote *The Lady of Shalott* in the volume of 1833, and the *Morte d'Arthur*. He also read Lady Charlotte Guest's translation of the *Mabinogion* from the Welsh. *Vivien* (as 'Merlin and Nimue'), and *Enid* (as 'Geraint and Enid') were privately printed in 1857. The first four *Idylls of the King* appeared in the autumn of 1864, and were welcomed by Thackeray. Later critics, rejoicingly emancipated, may find the *Idylls of the King* disgustingly respectable, moral, and Victorian. Their morality

is that of the Edwardian Malory, which was regarded as infamously impure by the Elizabethan Ascham, though we do not think of the Elizabethans generally as prudish. Macaulay, who had hitherto failed to appreciate Tennyson, applauded *Elaine* as 'the finest, sweetest, purest love poem in the English language.' As to the allegory about Arthur, the conscience of his knights, his behaviour is shabby in Malory; in Tennyson we confess that he doth preach too much. On the whole, however, with this exception, the chivalry, courtesy, gentleness, and ideal of chastity in the *Idylls* are the qualities of Malory. Only ignorance can accuse Tennyson of 'moralizing his song in a new and monkish manner,' as if it were to be performed in a drawing-room by an academy of young ladies. The poet later, following the example of Theocritus rather than that of Apollonius Rhodius, set forth the full Arthurian legend in a series of *Idylls*, not in a continuous epic. He saw that the age of epics had long gone by in English literature. The later *Idylls* are of various quality, but not one of them equals in splendour the *Morte d'Arthur* of his youth, or, in romantic value, *The Lady of Shalott* and the *Sir Galahad*.

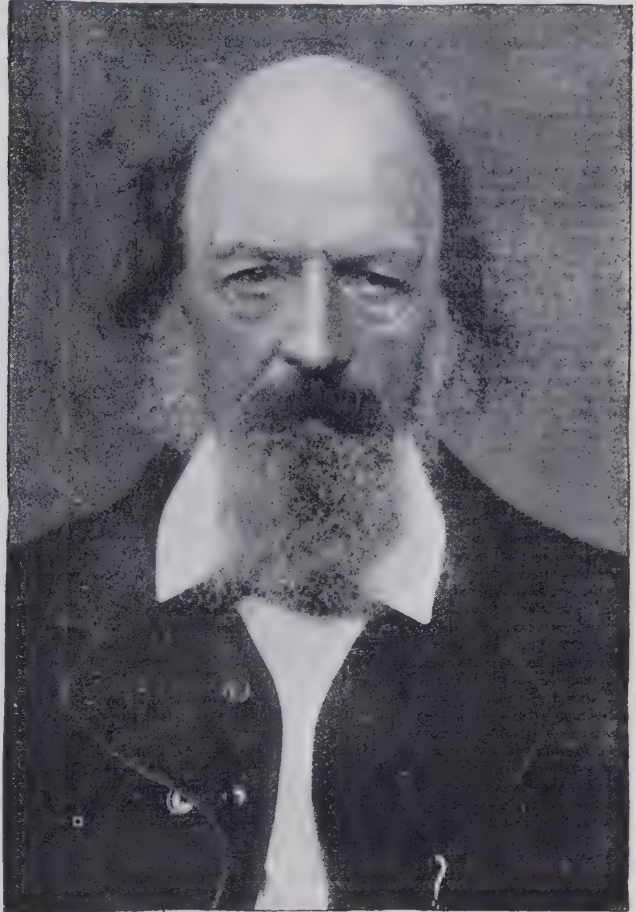
The next book was the popular *Enoch Arden*, which appealed to the same public as *The Queen of the May* and *The Miller's Daughter*. In the following year the later Arthurian poems came slowly to the birth. With 1875 began a long series of experiments in dramatic writing—*Queen Mary* (Tudor), *Harold*, *The Cup*, *The Promise of May*, *Becket*, and *The Foresters*. These have fine passages; and some of them, produced by Sir Henry Irving, were not without success on the stage. But it is not by his dramas that Tennyson is immortal. In 1884, Queen Victoria desired him to accept a peerage; he consented. The verses *To Virgil*, written at the request of the people of Mantua, are a noble tribute to the ancient poet most akin to Tennyson. The philosophical poems of his old age are valued according to the philosophical ideas of the reader, but there has been no difference of opinion about the wonderful lyric, *Crossing the Bar*, written in the laureate's eighty-first year—a marvel like the works of the old age of Sophocles and Titian. Tennyson is buried beside his friend Robert Browning, in Westminster Abbey.

The astonishing variety of Tennyson made him a poet as popular as he was learned. Like Virgil, he adorns his verse with many jewels reset from the great poets

of Greece. He plucks a flower here and there from the gardens of Virgil, Catullus, and Dante. His mastery of the mystery of words, as in the case again of Virgil, and his perfection of style stamp his work as immortal. From the languor of *The Lotus Eaters* to the resolution of *Ulysses*, from the prettiness of *The Gardener's Daughter* to the majesty

of *Wellington*. The principal biography is the *Life* (1897) by his son, the present Lord Tennyson. An edition of *In Memoriam*, annotated by the author, appeared in 1905.

Tennyson, afterwards TENNYSON-TURNER, CHARLES (1808-79). English poet, eldest brother of the poet laureate, was born at Somersby, Lincolnshire. He was



Tennyson.
(Photo by Barraud.)

of the *Morte d'Arthur*, from the burning passion of *Fatima* to the perfection of *vers de société* in *The Sleeping Beauty*, of monastic purity in *St. Agnes* and *Sir Galahad*, of romance in *The Lady of Shalott*, of tenderness in *In Memoriam*, of mystic speculation in *Tiresias*, he has touched every note in the organ—even the deep bass note of pride, regret, and patriotism, in the magnificent *Ode on the Death of the Duke of*

vicar of Grasby, Lincolnshire, from 1837 to 1879. In 1838 he took the additional surname of Turner. He collaborated with his brothers, Alfred and Frederick, in the volume published as *Poems by Two Brothers* in 1827; and he subsequently published on his own account *Songs and Fugitive Pieces* (1830), *Sonnets* (1864), and *Sonnets, Lyrics, and Translations* (1873). His *Collected Sonnets* were published in 1898.

Tennyson, FREDERICK (1807-98), English poet, brother of the preceding, was born at Louth. He collaborated with his brothers, Alfred and Charles, in *Poems by Two Brothers* in 1827; in 1854 he issued a volume of verse entitled *Days and Hours*. He published no more until *The Isles of Greece* (1890). The poetry in this gained such high praise as to lead him to follow it with *Daphne* in 1891, and *Poems of the Day and Year* in 1895.

Tennyson, HALLAM TENNYSON, SECOND BARON (1852), British administrator. He published his father's biography, *Alfred, Lord Tennyson: A Memoir*, in 1897, and edited *Poems by Two Brothers* (1895). He was appointed governor and commander-in-chief of S. Australia, and created K.C.M.G. in 1899; in 1902 he was made first governor-general of the Commonwealth of Australia, but vacated office in October 1903.

Tenon. See JOINERY.

Tenor, the name given to the highest natural singing voice of the adult male. It is also applied to instruments which play tenor parts, as the tenor-violin. Vocal tenor parts are now seldom written in the tenor clef, the treble or bass being usually employed.

Tenos, or **TINOS**, one of the Cyclades, Grecian Archipelago, S.E. of Andros, covers an area of 79 sq. m. The capital is Tenos, on the S. coast. Wine and marble are exported. Pop. 12,000.

Tenrec, or **TAILLESS HEDGEHOG**. See CENTETES.

Tent, white Spanish wines artificially coloured from red to dark brown; hence the name 'tinto' or tent. These wines are produced around Alicante and Malaga from the same variety of grapes as that used in the Mountain wines, but for the purpose they should be somewhat over ripe. Tent is a luscious, sweet, fine-flavoured wine, and owing to its low alcoholic content very generally used for sacramental functions, especially sacra and rota tent.

Tent, a shelter made of a flexible material, generally canvas, supported by one or more poles, and stretched by cords that are secured by pegs. Tents formed of goat and other skins were in use in the earliest times. They were also used by the Jewish patriarchs, the Greeks, and the Romans. The Persian monarchs had magnificent tents for travelling or for accommodation in the hot season, some of them capable of containing a hundred beds. In mediæval times princes and wealthy nobles owned large tents, divided into several compartments, adorned with silk and damask hangings and golden cords. At the present day, tribes

of Persians, Arabs, Mongols, American Indians, and Gypsies live in tents of varied construction. The Arab tent is not a sort of hut or bell-tent, but is a long black, 'house of hair,' with a low, sloping roof. Tents are also convenient for camping out. (See Lowndes's *Gipsy Tents and How to Use Them*, 1890.) Large tents, called marquees, are used for bazaars, flower-shows, outdoor fêtes, and similar purposes.

Tents are sometimes used with an army in the field; but they very much encumber the movements of troops by adding to the impedimenta, blocking the roads, lengthening the columns, and hampering mobility. Most authorities are agreed that the use of tents in modern warfare can only be exceptional and partial, and that the troops must either be quartered in such buildings as may be found available, or must bivouac in the open, as was done by the German army in 1870-1.

The tent in general use in the British army is that called the 'circular.' A battalion of infantry is given eight of these tents for the accommodation of the command and staff, and for general battalion purposes; eight more for the officers of its eight companies, and one for every fifteen non-commissioned officers and men. Thus, a battalion about a thousand strong would have to carry between eighty and ninety tents. In the mounted services a tent is allowed for every twelve men. The circular tent is 12½ ft. in diameter and 10 ft. high. It weighs when dry 74 lbs., but when wet often as much as 90 lbs. The pole is, for convenience of carriage, made in two pieces. All tents are now made of linen, although cotton was tried at one time. The circular tent is not used in India except in hill warfare. In that country, special double-pole marquees are in general use. The hospital marquee has three upright poles and a ridge-pole, weighs 512 lbs. when dry, has an oval shape, 50 ft. long by 36 ft. broad, and will accommodate eighteen sick or wounded men in cots. The *tente d'abri* is made of two sheets of linen, some pins, and rope. The two sheets fasten together and form a shelter just covering two or three men lying down, who carry the parts of the tent on the march. A proposal is under consideration (1906) to adopt it in the British army.

Tentaculites, a genus of fossil pteropods, small marine molluscs, abundant in the Ilfracombe beds, which belong to the Devonian period.

Tenterden, munic. bor., Kent, England, 18 m. S.E. of Maidstone,

is a member of the ancient town of Rye, and possesses all the privileges of the Cinque ports. Pop. (1901) 3,243.

Tenterden, CHARLES ABBOT, FIRST BARON (1762-1832), English chief-justice, was born at Canterbury. He was for several years a special pleader under the bar. In 1801 he became recorder of Oxford, and next year published a work on mercantile law. Puisne judge in Court of Common Pleas (1816), he was the same year moved to the King's Bench. Succeeding (1818) to the chief-justiceship, he was (1827) raised to the peerage.

Tenure means the manner in which lands or tenements are held, or the services which the tenant owes to the lord of whom he holds. When land is the subject of absolute ownership, the tenure is said to be allodial; when it is held of a superior, the tenure is feudal. All land in England has been brought under the feudal system, and is held of some lord as superior; but before the Norman conquest some lands were allodial. In Scotland there is still some land in Orkney and Shetland called udal land, which is not held of the crown or any other superior, and is therefore allodial. Under the feudal system the king is lord paramount, so that all land is ultimately held of the crown, though there may be mesne or intermediate lords. Feudal tenures were divided into free and villen tenures. The free tenures were:—(1.) Frankalmoin, or free alms, the tenure by which religious corporations held their lands. This was a spiritual tenure, and the services consisted in praying for the soul of the donor. (2.) Tenure in chivalry, which comprised, until its abolition in 1660 (which took effect as from 1645), the following species—(a) grand serjeanty; (b) homage ancestral, a rare tenure, in which homage or fealty was the sole obligation of the tenant; it occurred when there was a double prescription, and the tenant and his ancestors had held the land of the same lord and his ancestors, or of the same corporation, time out of mind; (c) knight service, of which esutage, cornage, castle guard, were some of the services. It had also many burdensome incidents, such as aids, wardships, marriages, which were all abolished, with the tenure, in 1660. (3.) Tenure in socage, which comprises (a) petite serjeanty and (b) common socage, which included all other free tenures, whether the services consisted of rent, either in money or in produce, or of agricultural labour. The statute of 12 Car. II. c. 24 turned all free tenures into common socage, but it did

not abolish the tenure of frank-almoign, or the honorary services of grand serjeanty. Unfree or villein tenure is now represented by copyholds, or lands held by the court roll of a manor.

By the common law lands held in fee simple could be alienated, and a tenure created between the feoffer and the feoffee; but subinfeudation was forbidden by the statute *Quia Emptores* in 1290; and since that date, when a man sells land in England, he does not create a tenure between himself and the purchaser, but the land is held by the purchaser of the same chief lord as the seller held it of. In Scotland, subinfeudation is the practice, the services reserved being a feu-duty or rent incident to tenure, and certain casualties or additional payments on death or alienation. See *Systems of Land Tenure*, edited for the Cobden Club by Probyn (new ed. 1881).

Teocalli ('house of God'), temple of the ancient Mexicans, was in shape a four-sided truncated pyramid, facing the four cardinal points, and rising in several terraces, on the top of which was the temple proper, with idol and sacrificial stone. Surrounding the teocalli were, in most cases, large courts occupied with the priests' dwellings, and used for the sacrificial rites. The great teocalli of Mexico, completed in 1486, measured 375 ft. long, 300 ft. broad, and 80 ft. high. The pyramid of Cholula, rising in four terraces, covered over twenty acres, and was 177 ft. high.

Tepic, tn. and health resort, cap. of Tepic territory (formed in 1889), W. Mexico, 28 m. E. of its port, San Blas; has manufactures of cotton goods and cigars. Pop. (1900) 14,560.

Teplitz, or TOPLITZ, tn. and wat.-pl., Austria, Bohemia, at the S. foot of Erzgebirge, 12 m. by rail W.S.W. of Aussig. The alkaline-saline mineral springs (73.5° to 98.5° F.) were known to the ancient Germans. In the vicinity are lignite mines. Teplitz has manufactures of pottery, chemicals, cotton, lace, machinery, and furniture. Pop. (1900) 24,110.

Terali. See TARAL.

Teramò (anc. *Interamnium*), cap. of prov. of same name, Italy, on the Tordino, 80 m. S. of Ancona; has silk-spinning and manufactures of pottery and leather. Its cathedral dates from the 14th century. Pop. (1901) 24,563.

Teraphim, household deities, worshipped by Israelites, Arameans (Gen. 35:2, 4), and Nebuchadnezzar (Ezek. 21:21). Their use is generally connected with divination (cf. Ezek. 21:21). Rachel probably stole Laban's (Gen.

31:34) to prevent him from discovering by their help the direction of Jacob's flight. Since Michal (1 Sam. 19:13, 16) used a muffled teraphim to imitate David, we infer that some of them represented the human figure and were nearly life size. Others must have been smaller, for Rachel concealed them beneath her. The early teraphim may have been mummied human heads, for which were afterwards substituted representations in wood and metal. Such heads were used for divination among the Hauranians.

Teratology is that branch of biological science which deals with monsters, monstrosities, malformations, or deviations from the normal types in the animal and vegetable kingdoms. Darwin defines monstrosity as 'some considerable deviation of structure, generally injurious or not useful to the species.' Human monstrosities, therefore, include cases of idiocy, hermaphroditism, redundancy of digits, limbs, or heads, absence of organs, fleshy union of two or more individuals (vide Siamese twins), and many abnormalities. Some class ordinary twin births as monstrosities.

Terburg, or TERBORCH, GERARD (c. 1617-81), Dutch painter, born at Zwolle, practised his art in Paris and Holland. At the Congress of Münster (1648) he executed his famous picture of the assembled plenipotentiaries. After working at Madrid, he returned to Holland, settling (1654) finally in Deventer, where, as town councillor, he figures in the picture gallery of the Hague. His style is characterized by accuracy and finish. See Michel's *G. Terburg* (1888).

Terce, or TIERCE, in Scots law, the right of a widow, who has not accepted any special provision, to life-rent one-third of her deceased husband's property, provided the marriage has endured for a year and a day, or has produced a living child.

Terceira. See AZORES.

Terebinth, 'the tree that weepeth turpentine' of Drayton, the 'terebinth good for gotes' of the *Shepherd's Calendar*, is an old name for the silver fir (*Pinus picea*).

Teretbratulæ, or LAMP-SHELL, a genus of brachiopods, including many fossil and a few living species, of which two are British. The shell is oval, markedly inequivalve, and minutely punctated. The beak is perforated by a circular aperture through which in life there passes the short stalk which attaches the animal to a stone or rock. Teretbratulæ are more or less social.

Teredo, or SHIP-WORM, a burrowing lamellibranch mollusc,

which is exceedingly destructive to submerged timber, and often works great havoc in wooden piers. The bi-valved shell is small and globular, and is open both in front and behind. The siphons sometimes reach a length of from two to three feet, and are united, except towards their ends, where they diverge. The siphons secrete a shelly investment which lines the burrow, and at the point where they separate there are two shelly plates, known as pallets. The gills are long and cord-like, and extend into the siphonal tube. Supports of piers, etc., are usually protected from ship-worms by copper sheathing or by broad-headed nails driven in close together. Ship-worms are widely distributed, a common species being *T. navalis*.



Teredo (Teredo navalis).

Terek. (1.) Russian prov. in the N. Caucasus, including the basin of the Terek, except a small portion near Kazbek, and bordering on the Caspian Sea from the mouth of the Kuma to that of the Sulak. Vladikavkas is the capital. Fully 80 per cent. of the inhabitants grow corn. The orchards, kitchen gardens, vineyards, and melon plantations are extensive. Cattle and horses constitute the wealth of the Kabardians and the Kumiks. Around Pyatigorsk are several spas much resorted to by Russians. Galena ore is worked. In the plains *kurgans*, burial tumuli of a vanished race, are a conspicuous feature. Area, 26,822 sq. m. Pop. (1897) 933,485. (2.) River, in N. Caucasus, rising to the S. of Mt. Kazbek at 8,200 ft., and having a course of 350 m. As far as Vladikavkas it flows within the mountains, passing through the Darial defile, where avalanches frequently impede its course. Near Kizlyar the river extends into a delta. The water is used for irrigation. On the r. bk. the Terek receives its most important tributary, the Sunzha.

Terence (c. 190-159 B.C.), Roman comic poet. His full name was Publius Terentius Afer. He was born at Carthage, and brought to Rome as a slave at an early age. His master was a senator, Terentius Lucanus, who gave him the education of a free man, and manumitted him. In 160 B.C. Terence went to Greece to study, and died while returning to Rome. He wrote

and exhibited six comedies—*Andria* (166 B.C.), adapted from Menander's play of the same name, with two scenes from the same poet's *Perinthia*; *Eunuchus* (161), adapted from two plays of Menander; *Heauton Timoroumenos*, or 'Self-Tormentor' (163), adapted from Menander's play of the same title; *Phormio* (161), an adaptation of the *Epidikazomenos* by Apollodoros of Carystus; *Hecyra* or 'Mother-in-law,' adapted from some Greek play; and *Adelphi* ('the Brothers'), adapted from Menander's play of the same title, with one scene added from a play by Diphilus. It is his best play, both in regard to the excellence of its plot, its character delineation, and its cheerful tone. Terence has always been regarded as a model of purity in Latin. Clearly he appealed rather to an aristocratic circle of critics than to the Roman populace. Editions: Text—Dziatzko (1884), Tyrrell (1903); with notes—Wagner (1869). Separate plays—*Adelphi*, Ashmore (1893); *Andria*, Freeman and Sloman (1885); *Eunuchus*, Fabia (1895); *Heauton Timoroumenos*, Gray (1895); *Hecyra*, Thomas (1887); *Phormio*, Sloman (1887). See also Engelbrecht's *Studia Terentiana*.

Teresa, or **THERESA**, ST. (1515-82), was born at Avila, Old Castile. Whilst still a child, she set out with her brother to seek martyrdom. She entered (1534) the order of the Carmelites at Avila; but a revolution in her soul, begun by the reading of Augustine's *Confessions*, was completed under the experience of her brother's death. In 1562 she dedicated herself to the mission of reforming the Carmelite order. Singlehanded, she had to face the opposition of all traditional Spain. Her courage and happy nature ultimately triumphed. Of delicate health, she had a leaning to mysticism, and was subject to supernatural visitations and trances. Yet withal she was of an eminently heroic, saintly, vivacious, and wholesome type of womanhood. She was canonized (1622), and in 1814 proclaimed the patron saint of Spain. Among her works, written in excellent Spanish, are her *Autobiography*, *Way to Perfection*, and 342 *Letters*. See the full and critical *Life*, in 2 vols., by Mrs. G. C. Graham (1894). An excellent self-revelation of Teresa and a sketch of her life are given in her *Letters* in John Dalton's translation (1902).

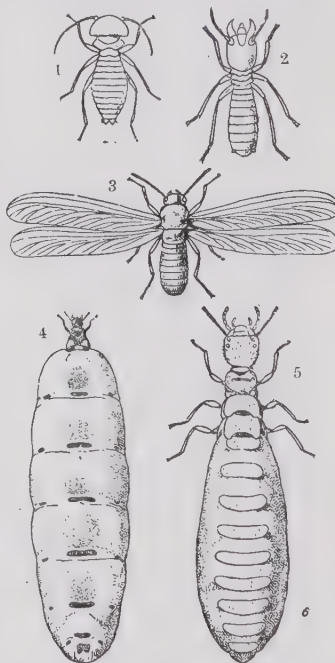
Terespól, tn. and fortress of Siedlce gov., Russian Poland, on W. Bug, opposite Brest-Litovsk; completes the fortified works of the latter.

Ter Goes. See **GOES**.

Terlizzi, tn., Apulia, Italy, 20 m. W. of Bari; produces wine and almonds. Pop. (1901) 23,394.

Termini Imerese (anc. *Therma Himerenses*), seapt. on N. coast of Sicily, 23 m. by rail E.S.E. of Palermo, near the site of the ancient Himera, whose ruins are still visible; has tunny and sardine fisheries. Its hot saline springs are much frequented. Pop. (1901) 20,633.

Terminus, in ancient Roman religion, a god who presided over boundaries, both public and private. His worship is said to have been instituted by Numa. Terminus was, in fact, Jupiter under a special aspect.



Termites.

1. Worker. 2. Soldier. 3. Male. 4. Queen, abdomen distended with eggs. 5. Supplementary queen.

Termites (Termitidæ), a family of insects often, but erroneously, called white ants. The true ants belong to the order Hymenoptera, while the termites, which are geologically much older, belong to the Neuroptera. Like the true ants, however, the termites are social insects, living in colonies, and building large nests. These communities reach their maximum size and importance in Africa, but the termites are widely distributed, some species occurring in S. Europe. The species which has always roused most interest is *Termes bellicosus* of Africa, first described by Smeathman in

1781. This species forms very large nests, sometimes twenty feet high, built of decayed wood and of the excreta of the termites, and from it subterranean passages extend in all directions. Within the nest occur four different kinds of individuals—(1) workers, which may be of either sex (contrast bees), but are always barren; (2) soldiers, which have greatly developed jaws, are also barren, and may be of either sex; (3) winged males and females, which are only present at certain times, and whose destiny it is to leave the colony, apparently with the object of founding new communities; (4) a royal pair, consisting of a male and female, which have lost the wings which they originally possessed. In *Termes bellicosus* the queen, or fertile female, is enormously large as compared with the other forms, reaching a length of from two to five inches. She is also exceedingly fertile, producing sixty eggs a minute, and being for an insect very long-lived. In some colonies, though not apparently in those of *Termes bellicosus*, there are also supplementary kings and queens, which can be brought into use if occasion arises. There is virtually no metamorphosis in the termites, and so far as is known the young at hatching are all alike. What determines their conversion into workers, soldiers, or fertile forms is not known, but the kind of food is probably very important. The winged forms, which in some colonies are very numerous, show a line of weakness at the base of each wing where these can be broken off, as they are when a winged pair becomes the royal couple of a colony. Except for these winged forms termites rarely appear in the air, for the integument is very delicate, and dry air is in many cases very fatal. Most species are always concealed under the surface of the ground, or in the wood upon which they feed. Some of the less specialized forms construct no definite nest, but live within dead or decaying wood, which at once shelters them and serves for food. Of the vast number of winged forms which some colonies produce relatively few survive, for they are eagerly preyed upon by many animals. See *Insects*, part I., in Cambridge Natural History.

Term of Years, in English law, means a lease. See **LANDLORD AND TENANT**.

Terms. Before the Judicature Act, 1873, there were four terms in the legal year—Michaelmas, Hilary, Easter, and Trinity—which extended respectively from the 2nd to the 25th of November, from the 11th to the 31st of January, from the 15th of April to the

8th of May, and from the 22nd of May to the 12th of June. The act of 1873 abolished terms, and they only now survive as the periods during which dinners are provided in hall for the benchers, barristers, and students of the Inns of Court. The scholastic year at Oxford is divided into four terms of the same names as the former law terms, and at Cambridge into three terms—Lent, Easter, and Michaelmas. The dates at which rent and other periodical payments of money become due in England are Lady Day (25th of March), Midsummer Day (24th of June), Michaelmas Day (29th of September), and Christmas Day (25th of December). They are usually called quarter-days.

In Scotland there are two legal terms for the payment of rent—Whitsunday (25th of May) and Martinmas (11th of November). Conventional terms, or terms agreed on by the parties, may, of course, be at any date, but commonly at Candlemas (2nd of February) and Lammas (1st of August). By the Removal Terms (Scotland) Act, 1886, the terms for removal and entry under leases, in the absence of express stipulation to the contrary, are the 28th of May and the 28th of November, and these are also the terms at which domestic servants are engaged.



Tern.

Tern, a name applied to the members of a group of genera of the gull family (Laridæ), these genera constituting a subfamily, the Sterninæ. Terns generally resemble the gulls, but are much smaller, more slender and graceful in build, and have very long pointed wings, and a usually forked tail. The bill is nearly straight, and is slender and pointed. The flight is irregular and hovering; owing to the forked tail and swooping movements the birds are often called sea-swallows. Their diet consists of fish, small marine organisms, together with insects, etc., the birds having a peculiar habit of beating up and down streams in search of food. Nesting is usually carried on in companies, the eggs, generally two or three in number, being merely laid in a depression of the ground. Terns are very widely distributed, and are

markedly migratory in habits. A number of species occur within the British area. The typical forms belong to the very large genus *Sterna*, in which the upper surface of the body is gray and the under white or lighter gray. Over most of the area the common tern (*S. fluviatilis*) is abundant. In the sooty terns the upper surface is dark in colour: an example is *S. fuliginosa*, which has been recorded in England, and breeds in Ascension Is. The noddies are terns of the genus *Anous*, while the marsh terns belong to the genus *Hydrochelidon*.

Ternate, tn, on E. coast of volcanic island of same name, East India Is. Pop. 3,000.

Ternaux-Compans, HENRI (1807-64), French bibliographer, born in Paris. After holding several diplomatic posts he published (1836) *Bibliothèque Américaine, 1493-1700*, and (1836-40) 20 vols., in a French translation, of *Voyages, Relations et Mémoires pour Servir à l'Histoire de la Découverte de l'Amérique*.

Terni (anc. *Interamna Umbra*), tn., Perugia, Italy, 50 m. N.N.E. of Rome; has iron and steel works in connection with the Italian navy. Its Roman remains (amphitheatre, bath, etc.) are of the most interesting nature. It was the reputed birth-place of Tacitus. The Velino waterfall (the marble cascade) is in the neighbourhood. Pop. (1901) 30,252.

Ternstroemia, a genus of tropical, evergreen, coriaceous-leaved shrubs and trees, belonging to the order Ternstroemiaceæ. All are easily grown as stove plants in well-drained peaty loam.

Terpander, ancient Greek poet, and founder of Greek music, was born at Lesbos. He flourished about 700 B.C. Of his poems only a few lines survive. In music he made the lyre seven-stringed instead of four-stringed. He is also said to have been the first to set poems to music. He left a school of followers, both in Sparta and at Lesbos, which flourished for several centuries. For his fragments see Bergk's *Poeta Lyrici Græci* (ed. 1900); and for his life and achievements, Monro's *Modes of Ancient Greek Music* (1894), and Gevaert's *Histoire et Théorie de la Musique de l'Antiquité* (1875-81).

Terpenes are hydrocarbons of the formula (C₅H₈)_n, probably being hydrides of cymene, or paramethyl-propyl-benzene. They form several classes, are present in the oils obtained by distillation from various plants, and closely resemble the best known of their number—viz. oil of turpentine.

Terpsichore, the muse of dancing. See MUSES.

Terra, or TELLUS, in Roman mythology, the goddess who personified the earth. See GÆA.

Terrace Gardens. A terrace usually signifies a flat walk, raised artificially or cut out of rising ground, immediately surrounding a house and separating it from the garden proper. The line of division between one level and another may be either a grass slope or a retaining wall. The advantages rest with the latter. In the first place, the great cost of mowing and making turf good is avoided; in the second, it is difficult to arrange a flower border at the foot of a grass slope, whilst in the case of a wall the space occupied by the grass slope can be utilized as a flower border. The principal lines of a terrace require to be carefully arranged parallel with, or at right angles to, the principal lines of the house. Terraces should be considered as a series of gardens, each division having its own particular charm. The hanging gardens of Babylon were gardens laid out on terraces.

Terraces are natural features which tend to be horizontal, and have steplike or shelflike contours. The seashore is generally marked by a marine terrace—a flat surface covered by the tide at high water. It is either a rocky ledge carved out of the land by the action of sea waves, or accumulations of sand, gravel, and stones washed up by waves and currents. Similar terraces are formed on the shores of lakes. If the water recede or the land be elevated, this shore terrace forms a land feature. Such raised beach terraces are common in Britain, N. America, Sweden, and Norway, often several hundred feet above the sea. They are especially well seen on the west coast of Scotland. Frequently three or more such terraces, one above another, may be observed. Stream terraces are shelflike ledges on the sloping valley sides, and may sometimes extend for miles, but are usually interrupted, and occur only in patches or fragments at irregular distances apart. Five or six such terraces are sometimes present, marking different levels of the stream. The highest terraces are of course the oldest. In S. England and France they often contain the rude stone weapons of Palæolithic man. River terraces always have a gentle slope in the direction in which the stream flows, while shore terraces are horizontal. The Faroe Is. and some of the Inner Hebrides consist of sheets of basalt, alternating with ash beds, or with softer rocks of the same kind, and their scenery is well known for its terraced

effects. But these terraces are never so level as those of streams and shores, and have an intimate relation to the geological structure and composition of the underlying rocks. At one time the escarpments, so well shown by the limestones of the south and east of England, were thought to be raised sea cliffs, but that has long ago been disproved. Magnificent examples of similar terraces are furnished by the great plains of the Colorado and Utah Desert. Artificial terraces on hillsides are sometimes due to old methods of cultivation, at a time when the swampy lower grounds were undrained. These are often seen on chalk hills in the south of England. Others are disused roads

mostly in use consists of potter's clay and powdered silica. To obtain a fine colour there is added iron ochre, brownstone, or umbra. Terra cottas have been found plentifully on sites of prehistoric culture in Egypt, Chaldaea, and Greece. Deriving from early historic times of Greece, there have been found painted plates in terra-cotta facing, and adorning architectural members. Recent excavations in Tanagra, Athens, and other places have yielded painted vases, and statuettes and figurines of surpassing gracefulness, representing women and maidens in long dress, fan or flower in hand, in all postures—lovers, Cupids, Psyche. Of inferior work-

History Museum of London is all faced with terra cotta. The tube stations of London are built in terra cotta, and a new variety faces the Savoy Hotel. In Germany are many terra-cotta factories. See Lecuyer's *Terres Cuites* (1882-92).

Terra del Fuego. See TIERRA DEL FUEGO.

Terra di Lavoro, Italy. See CASERTA.

Terranova, seapt. on s. coast of Sicily, occupies the site of the ancient Gela founded by Emperor Frederick II., 60 m. w. of Syracuse; has tinning and sardine fisheries, and exports wine, grain, and sulphur. Coarse cotton and woollen goods are manufactured. Pop. (1901) 22,019.



Terra-cotta Decoration, Italian, 15th century: The Annunciation, by Andrea della Robbia, in the Ospedale degli Innocenti, Florence.

and cattle-paths; a few are the remains of earthworks erected in Neolithic or early British times.

Terracina, tn., Italy, at s. end of Pontine marshes, 60 m. S.E. of Rome; has a cathedral, and the famous Roman remains, the Temple of Venus, long held to be the palace of Theodoric. The ancient city occupied the hill above the modern town. Pop. (1901) 10,995.

Terra Cotta, coarse earth or plastic clay, baked or hardened in the fire, of finer quality and harder than brick. Of terra cotta are made statuettes, busts, architectural decorations, but also flower-pots and drain-pipes. The clay should contain little or no lime or iron. The material now

manship is a rich collection from Myrina, Asia Minor. Lower Italy and Sicily have also yielded abundant specimens of Greek terra cotta. Terra cottas were produced in the early Roman age, and were later on used for sepulchral decoration. From Italy the art was, in the early centuries of our era, transplanted to Gaul and Britain. Crushed under the irruption of the barbarians, terra-cotta art revived after 1000 A.D. in the adornment of churches. The Italian renaissance produced terra-cotta statuary of finest art. Fitfully used since the 16th century, terra cotta has, especially within the last forty years, been more and more employed for fronts, columns, and cornices. The new National

Terrapin, a name given in America to a considerable number of the smaller tortoises, but especially to *Malacoclemmys terrapin*, the species which is most highly valued as food. This ter-



Terrapin.

rapin is found in the salt marshes of the east coast of N. America, and in some localities is kept in captivity in what are called 'crawls.' Here the terrapins are reared, and then fattened on

shrimps and crabs for the market. The females, called 'heifers,' are more highly prized than the males or bulls, and are larger, reaching a length of about eight inches on the plastron. The name terrapin is also applied to water tortoises of the genus *Chrysemys*, the larger species of which are eaten.

Terre Haute, city, Indiana, U.S.A., co. seat of Vigo co., on Wabash R., 72 m. s.w. of Indianapolis. It has distilleries, flour mills, and clothing factories. Pop. (1900) 36,673.

Terrell, city, Kaufman co., Texas, U.S.A., 32 m. E. of Dallas. Pop. (1900) 6,350.

Terrestrial Magnetism. See MAGNETISM, TERRESTRIAL.

Terrien de la Couperie, ALBERT (1845-94), was born in Ingoville (La Havre), Normandy, and was engaged in mercantile life in Hong-kong, where he became a master of Chinese and other Oriental languages. The resemblance between Babylonian inscriptions and Chinese characters arrested his attention, and he devoted himself to the comparative philology of Akkadian and Chinese languages. In 1884 he became professor of the comparative philology of S.E. Asiatic languages in University College, London. In 1892 he published *The Oldest Book of the Chinese*; his other works include *Early History of Chinese Civilization*, *Babylonia and China* (1887), etc.

Terrier. See AIREDALE, IRISH, FOX, SKYE, etc.

Terriss, ELLALINE, English musical and dramatic player, born in London, daughter of William Terriss. Four years after her debut in *Two Roses* (1887) she was constantly engaged for light-comedy parts. In *The Amazons* she showed a dainty sense of fun, and in *David Garrick* outstripped her usual range. At the Criterion till 1891, she next played at the Princess's, Court, and Lyceum. In America, with her husband, Mr. Seymour Hicks, she won warmest praise.

Terriss, WILLIAM (1847-97), the stage name of William Charles James Lewin, English actor, born in London. He first appeared on the stage as a professional Squire Thornhill in *Olivia*, an adaptation from the *Vicar of Wakefield*. This and his William in Jerrold's *Black-eyed Susan* (revived 1896) were his greatest parts; but he was associated in the higher drama with all the great actors of his time. He was assassinated as he was entering the Adelphi Theatre by an actor crazed by poverty (1897). See Smythe's *Life* (1898).

Territorial System. In 1881 the British army was reorganized on a territorial basis, by which

every battalion was assigned to some county or portion of a county for recruiting purposes. Several of the smaller counties, however, such as Cumberland, Westmorland, Buckinghamshire, Cambridgeshire, and Rutland, have no county corps. Lord Esher's Committee proposed to abolish this territorial scheme to a great extent, and to revert to the old regimental numbers; but this proposal has not been adopted.

Territorial Waters. The principal claim which is now recognized extends only to the belt of marginal waters round the coasts of a state within which, by the usage of nations, each state appropriates exclusive rights of fishing, and exercises general jurisdiction for its own protection, subject to the right of innocent passage by the vessels of other nations. The limit of territorial waters is generally regarded as a marine league from the shore, but all states are not agreed about this. Territorial jurisdiction is also claimed over inland seas approached by narrow channels, and over straits, gulfs, and bays; but the exact rights asserted are neither clearly defined nor generally agreed upon, and in some cases they are specially regulated by treaties. See also SOVEREIGNTY OF THE SEA.

Terror, REIGN OF. See FRENCH REVOLUTION.

Terry Family, English actors. Benjamin Terry (1818-92) and his wife did most of their work in the old 'stock' companies, though in later years the former secured engagements in London with Charles Kean and Macready. Their daughter Kate (b. 1844) was seven when she appeared as Robin in *The Merry Wives of Windsor* in Charles Kean's company at the Princess's Theatre, London. Ellen Alicia (b. 1848) was a year older when, at the same theatre, she took the part of the boy Mamilus in *The Winter's Tale*. They both remained at the Princess's till 1860. Kate in the interval playing Arthur in *King John*, Ariel and Cordelia in *King Lear*, and Puck in *A Midsummer Night's Dream*, and finally Arthur. Kate, after appearing as the *ingénue* in Wigan's version of Sardou's *Nos Intimes*, joined Fechter at the Lyceum (1862). Here she achieved a series of successes as Blanche de Nevers in *The Duke's Motto*, Ophelia, Viola, and Julia in *The Hunchback*. She married Mr. Arthur Lewis in 1867, and on August 31 gave her farewell performance. She made a reappearance at the Globe Theatre, under the management of Mr. John Hare, in 1898, in *The Master*.

Miss Ellen Terry joined Mr. J.

H. Chute's 'stock' company at the Theatre Royal, Bristol (1862); but early in 1863 she was again in London, and played at the Haymarket. She was married next year to Mr. G. F. Watts, the painter; but the marriage was soon afterwards dissolved. In December 1867 she acted for the first time with Henry Irving, playing Katharina to his Petruchio in Garrick's version of *The Taming of the Shrew*. This was at the Queen's Theatre, where she also appeared in *The Double Marriage* and *Still Waters Run Deep*. She retired from the stage in 1868, on her marriage with Mr. E. A. Wardell, an actor, whose professional name was Kelly (d. 1885). Her reappearance was made in 1874, at the Queen's Theatre, under the management of Charles Reade, as Philippa Chester in the novelist's play *The Wandering Heir*; but it was not till the following year, when she was engaged by the Bancrofts to play Portia in their revival of *The Merchant of Venice*, at the old Prince of Wales's Theatre, that real success was won. The reputation thus gained was enhanced by her subsequent performances at the Prince of Wales's as Clara Douglas in *Money* and Pauline in *The Lady of Lyons*. In the autumn of 1878 she passed to the Court Theatre, under Mr. John Hare, where her Olivia in W. G. Wills's play of that name was one of great beauty, sweetness, and delicacy, invested from first to last with an inexpressible charm. This led to Miss Ellen Terry's association with Henry Irving at the Lyceum. She made her first appearance at this theatre in December 1878, as Ophelia to Irving's Hamlet, and again achieved a brilliant success. This was the first of a series of delightful Shakespearean and other impersonations, the most noteworthy of which were Portia, Juliet, Beatrice, Viola, Lady Macbeth, Queen Katherine, Cordelia, Imogen, Marguerite in *Faust*, Nance Oldfield, Ellalina in *The Amber Heart* (described as one of her most exquisite creations), Rosamond in Tennyson's *Becket*, Madame Sans Gêne, and Alice-sit-by-the-fire. The artistic partnership continued till 1902. Sir Henry Irving then retired from the management, and Miss Ellen Terry formed a company of her own. In 1906, on attaining her stage jubilee, she was presented with a general memorial. See Monographs by Calvert (1897) and Hiatt (1898), and *Ellen Terry and her Sisters* by Pemberton (1902).

Florence Terry, the youngest sister, made her debut in 1870, was the original Little Nell in

Halliday's play of that name, and played Lady Helen when Irving produced *The Iron Chest* at the Lyceum. She died about 1896. Marion has won a high position as a powerful and sympathetic actress. She began her career in 1873, and has appeared in *The Red Lamp*, *The Ballad-monger*, *The Real Little Lord Fauntleroy*, *Sunlight and Shadow*, *Liberty Hall*, *The Idler*, and *Lady Windermere's Fan*. Fred Terry made his debut at the Crystal Palace as Bertie Fitzurse in *New Men and Old Acres*. He married Julia Neilson in 1892. The third generation of the Terry family is represented on the stage by Mabel Terry-Lewis, daughter of Kate; Ailsa Craig and Gordon Craig, the children of Ellen; and Minnie Terry, daughter of Charles, who has devoted himself to theatrical management in the provinces.

Terschelling, a Dutch Frisian isl., w. of Ameland, N. Holland. Pop. (1900) 3,929.

Tertian Fever. See MALARIA.

Tertiaries, men and women whose avocations prevented them from adopting the 'religious' life in its entirety, but who bound themselves, as lay members of the Franciscan, Dominican, Augustinian, Carmelite, or other similar institutions, to share in their devotions and take part in their work amongst the poor.

Tertiary, or Cainozoic, a geological epoch of the earth's history, subdivided into the Eocene, Oligocene, Miocene, and Pliocene systems. Its lowest strata rest inconformably on the eroded surface of the Cretaceous, while the whole series is in turn overlaid by the Quaternary, Pleistocene, or Glacial deposits. The break between the Tertiary and the Secondary strata in most parts of Europe is very well marked. The huge reptiles of the Secondary rocks vanished with great rapidity, while the mammals, hitherto small and of no great importance, suddenly assumed new forms, and appeared in great numbers and extraordinary variety. The ammonites and belemnites which flourished in Secondary seas also became extinct. In the flora the changes were not quite so profound. The fauna of even the earliest Tertiary rocks have quite a modern facies when compared with that which preceded it, and this becomes accentuated in the higher beds. In the Eocene there are about 3 per cent. of living species of Mollusca shells; in the Miocene less than 50 per cent.; in the Pliocene living species preponderate. The existing continents and oceans have for the most part originated, and have had their out-

lines fixed, in this epoch. The Alps, Caucasus, Apennines, Pyrenees, Himalayas, Cordillera, are essentially products of earth movements which went on in the earlier part of the Tertiary. The great volcanoes of Iceland, Mexico, the Andes, Japan, W. Indies, N. America, and the Pacific began their operations. In Skye, Mull, Hungary, Auvergne, the Eifel, and Italy there are also Tertiary volcanic foci, which are now extinct. In the Mesozoic and older Tertiary warm and moist conditions prevailed over a great part of the globe, but as time went on the distinctions between northern and tropical faunas are more pronounced, till at the close of the Pliocene alternations of temperate and cold conditions ensued in Britain, which culminated in the glacial and interglacial periods of the Pleistocene.

Tertullian. QUINTUS SEPTIMIUS FLORENS TERTULLIANUS (c. 160-230), one of the greatest of the church fathers, was born in Carthage, the son of a Roman centurion, and became a Christian while still a young man. He is reckoned the father of ecclesiastical Latinity. In his later years he allied himself with the Montanists, and arraigned the defections of the church with extreme rancour. The numerous works of Tertullian, nearly all of which are extant, may be divided into three classes:—(1.) The apologetic writings: *Ad Nationes* and *Apologeticus*, a plea for toleration, the one simply a recast of the other; *Ad Scapulam* (proconsul under Septimius Severus); *De Testimonio Animæ*, and *Adversus Judæos*—in these Christianity is regarded as a supernatural magnitude, poles removed from even the highest heathen philosophy, and a challenge to all human wisdom. (2.) The anti-heretical writings: *De Præscriptione Hæreticorum*, demonstrating that the heretics have neither part nor lot in the Christian privileges, which belong only to the upholders of the original apostolic tradition; treatises against Praxeas, Marcion, and Hermogenes (a Platonist); *De Carne Christi*, against Docetism; *De Resurrectione Carnis* and *De Anima*, against the false spirituality of the Gnostics. (3.) The practical treatises: on Baptism, Repentance, Spectacles (heathen festivities, etc.), Idolatry, Women's Dress, Prayer, and Patience; *De Virginibus Velandis*, against the unveiling of unmarried women in church; and the exhortations *Ad Martyres* and *Ad Uxoŕem* (to his wife on Christian marriage)—all more or less showing a tendency towards asceticism. The tractates of the

Montanist period are *De Corona Militis*, the wearing of the soldier's garland by Christians; *De Fuga in Persecutione*, *Scorpiace adv. Gnosticos*, against the fear of martyrdom; *Exhortatio Castitatis* and *De Monogamia*, against second marriages; *De Pudicitia*, the 'mortal' character of sins of unchastity; *De Jejuniis contra Psychicos*, in favour of the Montanist views of fasting; and *De Pallio*, vindication of the Christian's wearing the philosopher's mantle. Tertullian was a born controversialist, and even his most practical treatises are polemical. He dreaded the speculations of the learned equally with the laxity of a worldly church, and saw in both the very spirit of Antichrist. He combined a characteristically Roman concreteness and common sense with a Punic crudity and impetuosity, and was an entire alien to the Hellenic spirit of emancipated thought and artistic harmony. See Oehler's edition of works (1853-55); also four volumes in the *Ante-Nicene Christian Library*; Neander's *Antignostikus* (trans. as appendix to *The Planting of Christianity*, 1851); volumes by Grotmeyer (1863-5), Hauck (1877), and Bonwetsch (1878); Farrar's *Lives of the Fathers*, vol. i. (1889).

Teruel. (1.) Province, Spain. The district is almost entirely mountainous, and is watered by the Guadalquivir and the Guadalupe. The industries are mainly agriculture and forestry, with mining and weaving. Area, 5,720 sq. m. Pop. (1900) 246,001. (2.) City, cap. of prov. of same name, Spain, 88 m. s. of Saragossa. Very ancient city, on a high bluff over the Guadalquivir. It has narrow streets, with many old churches. Pop. (1900) 10,797.

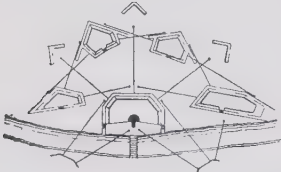
Teschen, tn., Austria, prov. Silesia, 30 m. S.E. of Ratibor (Prussian Silesia), with manufactures of furniture, linen, vehicles, beer, and spirits. It has the remains of an old castle. Here was signed, in 1779, the treaty of peace which terminated the war of the Bavarian succession. Pop. (1900) 19,142.

Tesla, NIKOLA (1857), electrician, was born in Servia; went to America in 1882, and entered the employment of Edison. He is possessed of a strong and ingenious inventive capacity, the most striking of his inventions being a coil of small self-induction, by use of which a rapidly alternating oscillatory current can be obtained. In spite of the high potentials involved, these rapid alternating currents are harmless, and have indeed been found highly beneficial in curing skin diseases, such as lupus. A vacuum tube placed in the vicinity of the Tesla coil becomes luminous, al-

conscious. The temperature frequently rises to 105° F. before death, and sometimes continues to rise to 109° or 110° after death has occurred. A fatal result is usually due to asphyxia from spasmodic contraction of the respiratory muscles; sometimes, however, it occurs from heart failure, and occasionally from cerebral hæmorrhage. The prognosis of tetanus is always extremely grave, and the shorter the incubation period the more severe is the disease.

Every wound likely to lodge tetanus spores should be thoroughly cleaned, and all foreign bodies, such as splinters, should be speedily removed. Should there be reason to suspect tetanus infection, an injection of tetanus antitoxin should be made as speedily as possible. When the disease is established, the injection of antitoxin should be repeated frequently, part of it being introduced at the site of infection. The antitoxin does not free the nerve cells from the poison already absorbed, but it destroys the toxin still circulating in the body fluids. Antiseptics should be applied to the wound, and the patient's strength should be maintained by careful feeding with liquids through a nasal tube or by the rectum. To decrease the tendency to spasm, the patient should be isolated in a quiet and dark room. Narcotics, such as chloral, opium, and morphine, may be given freely, and chloroform is frequently necessary during the paroxysms.

Tetbury, mkt. tn., Gloucestershire, England, 10 m. s.w. of Cirencester. The town hall is an Elizabethan structure. Pop. (1901) 1,989.



Plan of a Tête de Pont.

Tête de Pont, or bridge-head, a work in fortification protecting the end of a bridge, or the communication across a river, nearest the enemy. A central work immediately commands the bridge, and at an interval from it extends, in a wide arc, a line of redoubts.

Tethys, in ancient Greek mythology, a sea-goddess, daughter of Uranus and Ge, and wife of Oceanus, by whom she was the mother of the Oceanides and of the many river-gods.

Teton, a short mountain range in W. Wyoming, U.S.A. The highest summit is Grand Teton

(13,671 ft.). This, with two other peaks, forms the 'Trois Tetons' of the early trappers. Another summit farther north, Mt. Moran, has an altitude of 12,600 ft.

Tetradron. See POLYHEDRON.

Tetrao. See BLACKCOCK and CAPERCAILLIE.

Tetrarch, the ruler of the fourth part of a country. There were tetrarchs of Thessaly and of Macedonia, under Roman rule, and each of the three Gallic tribes in Galatia was divided into four parts ruled by a tetrarch. The title is best known in connection with the family of Herod. Later the Romans gave it to any tributary prince whose dignity did not claim the title of king.

Tetuan, fort. seapt. tn., Morocco, on the Mediterranean, 22 m. s. of Ceuta. Exports (£10,911 in 1905) include eggs, slippers, beeswax, and raisins; imports (£56,495 in 1905) are principally flour, cottons, and sugar.

Tetzel, JOHN (c. 1455-1519), the dealer in indulgences whose traffic provoked Luther's historic theses affixed (1517) on Wittenberg church. Native of Saxony and a Dominican (from 1489), he was (1502) appointed preacher of indulgences. See *Lives*, on Catholic side, by Gröne (2nd ed. 1860) and Paulus (1899); on the other side by Hofmann (1844) and Körner (1880).

Teucer. (1.) In Greek legend, a son of the river-god Scamander and the nymph Idæa, and the first king of Troy; from him the name Teucri is often given to the Trojans. (2.) The son of Telamon of Salamis; went with his half-brother Ajax to the siege of Troy, and there distinguished himself by his archery. On his return Telamon expelled him for having failed to avenge the death of Ajax. He emigrated to Cyprus, and founded the town of Salamis.

Teucri. See TEUCER and TROY.

Teuffel, WILHELM SIGISMUND (1820-78), German philologist, was a native of Ludwigsburg. In 1846 he succeeded to the editorship of the *Realencyclopædie der Classischen Altertumswissenschaft*. Appointed (1849) professor of classical philology in Tübingen, his chief work is *Geschichte der römischen Litteratur* (1870; 5th ed. 1890).

Teutoburger Wald, a range of hills in the region of Münster in N.W. Germany; famous as the scene of Arminius's defeat of Varus and the Romans in 9 A.D.

Teutones, a Germanic tribe which, in conjunction with the Cimbri, after defeating several Roman armies and devastating Gaul, was annihilated at Aquæ Sextiæ by Marius in 102 B.C. In later times a tribe of Teutones

dwelt in N.W. Germany, between the Elbe and the Baltic. They were probably the original stock from whom the invading Teutones were an offshoot.

Teutonic Knights, a quasi-religious society of German crusaders. The order owed its beginning to merchants of Bremen and Lübeck, who opened a hospital at Acre in 1190; but it speedily became a military rather than a religious caste. The members consisted of knights, priests, and serving-brothers. They undertook to take care of the sick, to fight against the heathen, to defend the Holy Land, to protect the church and its servants, also widows and orphans. The distinctive dress was a white cloak bearing a black cross. The organization was closely akin to that of the Hospitallers or of the Templars. The 'heathen' against whom they chiefly fought were the natives of the territory between the Vistula and the Gulf of Finland. This 'crusade,' begun in 1225, was really a war of conquest, and ended in the almost complete extermination of the 'pagans,' whose lands were thereafter occupied by German colonists. In 1237 the order absorbed the more distinctively military order of the Brethren of the Sword, who had laboured to convert to Christianity Livonia, Esthonia, and Courland. The period during which the Teutonic Knights held sway was the 13th and 14th centuries, and their rule extended from Pomerania to Narva. Of their many famous castles and strongholds Marienburg was the chief, being the seat of the grand master. See Voigt's *Geschichte des deutschen Ritterordens* (1859), Steinbrecht's *Preussen zur Zeit der Landmeister* (1888), and Holzgräfe's *Der Deutsche Ritterorden* (1903).

Teverone, Italy. See ANIO.

Teviot, riv., Roxburghshire, Scotland, rising between that county and Dumfriesshire. After a N.E. course of 40 m., it joins the Tweed at Kelso. Hawick is the only important town on its banks. The salmon and trout fishing are excellent.

Teviotdale, the greater part of Roxburghshire, Scotland, comprising the area drained by the river Teviot and its tributaries.

Tewfik Pasha, MOHAMMED (1852-92), Khedive of Egypt, was the eldest son of Ismail Pasha, whom he succeeded in 1879. The principal events of his rule were the insurrection of Arabi Pasha, suppressed at Tell-el-Kebir; the uprising of the Mahdi in the Sudan, and the Sudan campaigns. Tewfik was, on the whole, a loyal ally of the British.

Tewkesbury, munic. and mrkt. tn., Gloucestershire, England, 10 m. N. of Gloucester, on the Avon, near its confluence with the Severn. The abbey church, a magnificent structure, founded at the beginning of the 12th century, enlarged and embellished by the Despensers (15th century), contains ancient monuments. Of the abbey, originally founded c. 715, and afterwards richly endowed, the gateway, part of the cloisters, and some other fragments remain. In the town are ancient dwelling-houses. Tewkes-

seceded from Mexico in 1836, and in 1845 was admitted as a state. Stretching over 10½ degrees in latitude and 13½ in longitude, it presents great differences in surface, altitude, and climate. The coast is low, and in many places marshy and bordered by sandbars. Inland the surface rises gradually, and with gentle slopes. West of the middle of the state, however, rises an escarpment, the eastern edge of the Llano Estacado, stretching from the N. boundary southward nearly across the whole state. From this

state is well timbered with valuable yellow pine. Elsewhere tree growth is limited to post oak, mesquite, and other inferior woods, and the w. part of the state is almost treeless. Austin is the capital. Farming is by far the predominant interest. The principal crops are cotton, Indian corn, oats, wheat. The cotton crop is far larger than that of any other state. Live stock are pastured on the great plains in the w. The manufactures are not of great magnitude. The leading products are lumber, oil, cotton



bury was the scene of a Lancastrian defeat (1471). During the civil war it was alternately held by Royalists and Parliamentarians. Pop. (1901) 5,420.

Texarkana. (1.) City, Bowie co., Texas, U.S.A., near the boundary line with Arkansas. Pop. (1900) 5,256. (2.) City, Arkansas, U.S.A., the co. seat of Miller co., on the boundary line with Texas. Pop. (1900) 4,914.

Texas, southern state of the United States of America, fronting on the Gulf of Mexico, and bordered on the s.w. by the Rio Grande. Area, 262,290 sq. m. It

escarpment stretches westward a great desert plain, level and waterless, with an altitude of from 3,000 to 4,500 ft. In it is cut the valley of the Pecos R., w. of which is a succession of broad desert valleys, alternating with narrow mountain ranges and groups of igneous mountains. The Rio Grande is the longest river of the state. Red R., with Oklahoma and Indian Territory, forms a part of its N. boundary, and the Sabine R. separates it in part from Louisiana. Other rivers of the state are the Trinity, Brazos, Colorado, and Nueces. The N.E. part of the

seed and cake, flour, and shipbuilding. The mineral wealth consists mainly of petroleum, recently discovered. Iron ore of low grade and a little coal are found; gold, silver, and mercury are mined to a small extent. Pop. 1900 3,048,710. The foreign-born numbered 179,357, and the negroes 620,722.

Texel, low-lying isl., the southernmost and the largest of the W. Frisian group, N. Holland, at the entrance to the Zuider Zee; covers an area of 70 sq. m., and is separated from the mainland by the Marsdiep. Fishing and

piloting are the chief industries. Wool and cheese are exported. Several memorable naval engagements have taken place in its vicinity. On July 31, 1653, Van Tromp lost his life in an encounter he and De Ruyter had with the English under Blake, Dean, and Monck. Here the English and French, under Rupert and D'Estrées, were attacked by De Ruyter (Aug. 11, 1673). The

perpetual youth. His image, of polished black stone, was garnished with gold plates, and especially with a burnished shield, in which Tezcatlipoca saw reflected the ongoing of the world. A captive of fair and unblemished form was occasionally sacrificed to Tezcatlipoca.

Tezcucó, or **TEXCOCO**, tn., Mexico, on E. shore of Tezcucó Lake, opposite to and 16 m. E.



William Makepeace Thackeray.
(From the drawing by Samuel Lawrence.)

French behaved badly; the English and Dutch fought furiously. Admiral Sprague was killed. De Ruyter escaped decisive defeat. On October 11, 1797, Duncan defeated the Dutch here. Pop. (1900) 5,954.

Textiles. See **FABRICS**, **TEXTILE**.

Tezcatlipoca, one of the chief gods of the Aztecs. The creator of the world, he was represented as a handsome man, endowed with

of Mexico city; was an important Aztec centre, and the point from which Cortes prepared his attack on Mexico. It has railway workshops, glass works, and cotton factories. Pop. 16,000.

Thaarup, **THOMAS** (1749-1821), Danish poet, born at Copenhagen; appointed professor of history and philosophy at the Royal Naval Academy (1781). The year after his death his friend the critic Rahbek published his *Efterladte*

Poetiske Skrifter, which immediately attracted attention by their warm patriotism and noble simplicity, greatly enhanced when set to Schulze's fine music. His translation from the German of the pamphlet *Moses und Jesus*, in 1813, marks the beginning of the persecution of the Jews in Denmark.

Thackeray, **ANNE ISABELLA** (MRS. RITCHIE), English author, daughter of the novelist. Her publications include the *Story of Elizabeth* (1863), *Old Kensington* (1873), *Toilers and Spinsters* (1873), *Anne Evans* (1880), *Mme. de Sévigné* (1881), *Lord Tennyson and his Friends* (1893), editions of her father's works (1898), *Truthful Liar* (1903).

Thackeray, **WILLIAM MAKEPEACE** (1811-63), English novelist, was born at Calcutta. His knowledge of the humours of Indian civilians and soldiers inspired the immortal pictures of Joe Sedley, Major Geoghegan (the Marbot of Ireland), Colonel Newcome, and many other figures in his novels. In 1828 he went to Trinity College, Cambridge, where he knew Tennyson and Fitzgerald, his lifelong friends; wrote a burlesque on Tennyson's prize poem *Timbuctoo*, and contributed to the *Snob* and the *Gownsmen*. In 1830 he visited Weimar, and saw Goethe and sketched caricatures. Returning to London, he invested money in the *National Standard*, which was a failure; lost more money over another newspaper, acted as its Paris correspondent, and in 1837 came back to town as a literary hack. This was the period of 'Michael Angelo Titmarsh,' of the earlier 'James de la Pluche,' of *The Shabby Genteel Story*, of *The Hoggarty Diamond*, touched by the great and lifelong sorrow of the author's life; for his young wife's health (1841-4) left him a lonely man, with a broken heart. *Catherine*, too, was of this period. *The Paris Sketch Book* is historically interesting, as is *The Irish Sketch Book* (1843). *Punch* now welcomed the sketches and papers of Thackeray, and he wrote *Barry Lyndon*, which was not at first recognized as the masterpiece that it is. The Cairo journey and book are of 1844-6, but *The Snob Papers* of the same date brought more notoriety to the author. Thackeray became unhappily obsessed by the idea of the snob. Social self-consciousness was the least amiable quality of this great man, and he knew it. The contemporary *Novels by Eminent Hands* were more to his taste, and he is said to have averred that *George de Barnwell*, the burlesque of Lytton, was his favourite among his own pieces. In 1853 he left Mr. Punch's serv-

ice, partly for political reasons, more perhaps because he wearied of the cap and bells.

In 1847 *Vanity Fair*, commenced long before, began to appear in its yellow livery, was reviewed when half finished by Hayward in the *Edinburgh Review*, and was so popular that Thackeray became the unwilling rival of the author whom he so constantly and generously applauded—Charles Dickens. They are as unlike each other as Richardson and Fielding but, being contemporaries, have ever since been pitted against each other. Both suffered greatly, as regards their art, from too prolonged publication in monthly numbers. Both wrote with the printer's devil at the door; both have *longueurs*; neither excels in construction and conduct of a narrative.

Vanity Fair at once, and deservedly, raised Thackeray to the highest rank in fiction. *Pendennis*, begun in November 1848, is somewhat autobiographical. Rich as it is in delightfully humorous creations, its heroine, Blanche Amory, is but Becky on a lower level, and the author's long illness caused him to forget the writing of part of the novel. As to Colonel Amory, the author frankly confessed that he had not the heart to carry out his original plan. We may not think so highly of Stanner Warrington as the author does; we may not have his obvious passion for Laura; but the Major, Costigan, the Chevalier Strong, Mr. Henry Foker above all, we take to our hearts, and their names are household words. Shandon, Doolan, Bungay, all the literary people, add to that great pell-mell of friends; and Thackeray, like Dickens, Scott, and Fielding, is not really greater in his great characters—Becky, Beatrix Esmond, and the rest—than in the multitude of minor persons that crowd his pages and our happy memories. A casual flunky, like him who saw no profit in 'a haltercation,' a chance postilion, a convivial Irishman like the Mulligan, a valet like Morgan, if left a lonely fragment, would suffice to prove the greatness of the artist.

In 1851 Thackeray delivered lectures—'The English Humorists of the Eighteenth Century.' He spoke of the humorists as he found them, giving his impressions as he might have done in talking about people whom he had met. This was not 'scientific criticism.' But Thackeray's candid prattle is much more human and entertaining than any impartial appraisement or estimate. His appreciations are always personal and interesting; his likes and dislikes are vivacious, acute, and unaffected. While

working on *The Humorists*, Thackeray was also writing, or rather was dictating, *Esmond*. That so much of the unsurpassed eloquence of *Esmond*, stately, musical, varied, in the style of a dead century, should have been spoken while the author smoked his cigar, is a kind of literary miracle. Perhaps no man was ever such an absolute master of the instrument of prose; in no man's hands was language so plastic. The styles of the 18th-century essayists and of Fielding are the background, or *prima materies*, of his own; but his rings on occasion with a deeper note, surprises with a graver melody, or delights by the turns that make slang classical, stamping the fugitive and familiar with the author's own image and superscription. Thackeray went to lecture in America in the autumn of 1852, and again in 1855. *Esmond* was not at the moment so generally popular as *Vanity Fair*, but posterity has judged it equal in renown. To us Thackeray seems to know the manners of Queen Anne, the great world especially, as well as those of early Victorian times. Considered historically, the picture of King James is grotesquely wrong; the author was misled by uninformed historians and contemporary libels. The splendid figure of Beatrix Esmond makes all readers her lovers; and it may not be wholly unjust to resent her second appearance in *The Virginians*, grand as is the closing scene. In *Esmond* Thackeray proved that he was a master of high romance, and that he could exhibit with moving skill that noble old passion of loyalty as it was felt by Dundee, by the great Montrose, by the gentle Lochiel, by many a forgotten man and woman, cheerful givers of lands and life for a doomed king and a forlorn cause. To be a great humorist, a great satirist, a great romanticist, and a great master of language—these are glories beyond the achievement of any other novelist. To have written *Mrs. Perkins's Ball*, *Vanity Fair*, *The Rose and the Ring*, *Esmond*, and the *Roundabout Papers*, is to have combined excellences so great and so various that we can only 'wonder with a foolish face of praise' at the genius which attained to these perfections. Beyond all novelists, except Fielding and Scott, Thackeray was, though not technically a 'scholar,' certainly 'a full man,' a man of much reading, familiar with the world of books as well as with the world of men. *The Newcomes* (1853-5) was pronounced to be 'Mr. Thackeray's masterpiece' by the *Quarterly Review* (cited by Mr. Whibley). Posterity scarcely

confirms the verdict, preferring *Vanity Fair* and *Esmond*. The character of Ethel has probably more admirers than any other of the author's heroines, charmed as they are by the girl's victorious resistance, at the last, to the world and Lady Kew. The good colonel has drawn tears from eyes commonly as dry as those of Aramis, and Barnes Newcome is a worthy pendant to Mrs. Mackenzie. There is, happily, relief enough in F. B., in Charles Honeyman, in Gandish, the Sherricks, and a score of other characters, including the delightful Florac; and Madame d'Ivry was not the last lady to think herself Mary Stuart reborn too late into a world too old.

The Virginians (1857-9) was the work of a man confessedly weary. But the return of Harry Warrington to Castlewood, and his early adventures, are in the author's best manner; in George Warrington we see a case of heredity—he is Colonel Esmond come back to life. Will Esmond is 'a splendid natural blackguard,' like Jack Spraggon; and it is curious to see how, in George Warrington's years of slavery to the press, Thackeray remembers his own early times of newspapers and magazines. The lectures on *The Four Georges* are, as history, but lazily written. In 1860 he started the *Cornhill Magazine*, a great triumph in its way; but the editorial work tired him and wrung his heart, and he resigned in 1862. Thackeray's tale *Philip* was 'weary work,' he said, and no more need be added on that subject. His sudden death left but a fragment of his *Denis Duval*, in which the early freshness was wedded to the maturity of his genius. Thackeray's heart was as great as his intellect—his humour is the child of love: he is where Scott and Fielding are. His verses bear witness to a poet, and are admirable on every hand, being as many-sided as his nature.

Thackeray refused to permit a biography of himself to be written. The record by his son-in-law, Sir Leslie Stephen, in the *Dictionary of National Biography*, with the introductions to his works (1898-99) by his daughter, Mrs. Ritchie, give, with his own works, the best account of the man. There are also the Monographs by Anthony Trollope (1879) and by Charles Whibley (1893); the latter is critical rather than biographical.

Thaddæus. See JUDAS.

Thais, Athenian courtesan, who accompanied Alexander the Great on his expedition into Asia. After Alexander's death she was attached to Ptolemy, son of Lagus, to whom she bore three children. She was famous for her skill in repartee.

Thalamus, name given to the receptacle or terminal part of the axis of a flower. Sometimes the thalamus extends beyond the carpels as a fleshy mass, as in the strawberry; or as a cone round which the fleshy carpels cluster, as in the raspberry; or as a beak, as in geraniums.

Thalberg, SIGISMUND (1812-71), pianist, born at Geneva; studied the piano and composition under Mittag and Sechter. He possessed great power as an executant, and had a fascinating touch in legato playing. His compositions for the piano are numerous.

Thales, the chief of the seven wise men of ancient Greece, was a native of Miletus, and flourished from about 600 to 540 B.C. His claim to be the founder of mathematics depends on his proofs of some of the elementary propositions of geometry; in astronomy his great achievement was his prediction of the solar eclipse which occurred on May 28, 585 B.C. In philosophy he sought for a single element out of which the whole world was formed; this he found in water, or rather moisture. In politics he is famous for his advice to the Asiatic Greeks to join themselves into one single nation, with Teos for the capital, in order to resist the Persians.

Thalia, the muse of comedy. See MUSES.

pinum, the Alpine meadow rue, *T. minus*, the lesser meadow rue,



Thalictrum (*T. flavum*).

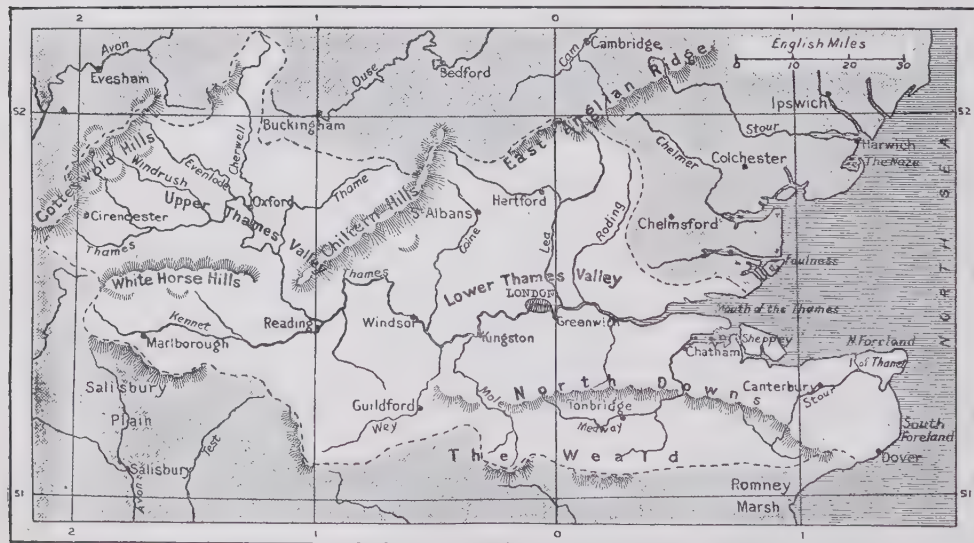
1, Perianth; 2, carpels; 3, single carpel; 4, stamens.

and *T. flavum*, the yellow meadow rue, are natives of Britain.

works in which sulphuric acid is made. The element is displaced from solutions of its salts by zinc, is a heavy (sp. gr. 11.9), very soft leadlike metal, which melts at 302° C., and is a poor conductor of electricity. The metal tarnishes in the air, forming the oxide Tl_2O , or in presence of water the hydroxide $TlOH$, a strongly alkaline substance resembling the hydroxides of the alkali metals. On the other hand, thallous chloride is precipitated by hydrochloric acid, and thus resembles the silver salt. Thallium also forms thallic salts—e.g. $Tl_2(SO_4)_3 \cdot 8H_2O$ —and is distinguished by the bright green it gives to the flame, showing a characteristic green line in the spectrum. Thallium salts are poisonous, and, like the element itself, have as yet no commercial application.

Thallus. See FUNGI.

Thames, riv., England, rises in Gloucestershire, 3 m. s.w. of Cirencester, or perhaps better at Seven Springs in the Cotswold Hills, 3 m. s. of Cheltenham. The Thames (known also as Isis above Oxford) separates the counties of Gloucester, Oxon, Bucks, Middlesex, and Essex, on the N.; from Wilts, Berks, Surrey, and Kent, on the S. Tributaries—r. bk., Ock, Kennet, Laddon, Wey, Mole, Darent,



Basin of the Thames.

Thalictrum, a genus of hardy herbaceous plants belonging to the order Ranunculaceae. They usually bear panicles of small flowers, with four or five petaloid sepals and no corolla. *T. al-*

They are easily grown in ordinary garden soil.

Thallium, Tl, 204.1, is a rare metallic element that occurs in traces in pyrites, and is best prepared from the flue dust of the

and Medway; l. bk., Coln, Leach, Windrush, Evenlode, Cherwell, Thame, Brent, Lea, and Roding. At London Bridge the river has a width of 266 yards, and below Gravesend it expands into an

estuary five miles wide at the Nore. The tide ascends to Teddington, the upper limit of the Port of London. There are numerous locks—the lowest at Teddington, the highest near Cricklade. Vessels of 4,000 tons reach Blackwall, river steamers ascend to Oxford, barges to Lechlade, and small barges to Cricklade. The Thames and Severn Canal joins at Lechlade, and the Berks and Wilts near Abingdon. Immense docks—London, St. Katharine's, Millwall, East, South-west, and West India, Victoria, Albert, and Tilbury—border the N. shore; and on the S. are the Surrey and Commercial Docks. The stretch between the Tower and Wapping

control of explosives and petroleum, traffic and fisheries, prevention of pollution, preservation for recreation of non-tidal part of river, and control of pleasure navigation. By an Act of 1894 it was reconstituted and its powers amended and extended, including that of dredging down to the Nore.

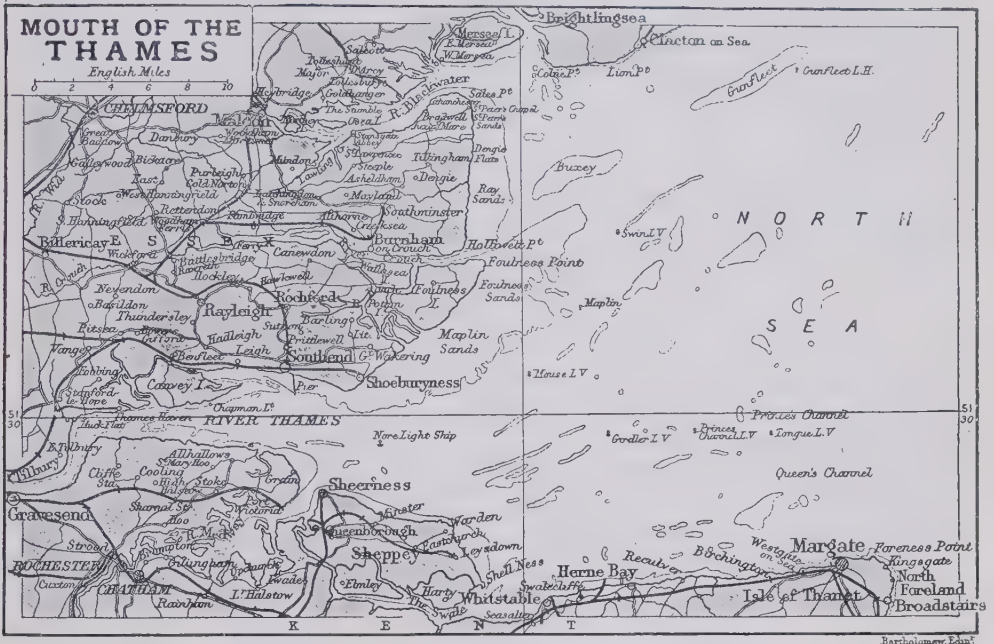
Thamugas, now TIMGAD, near the Aures Mts., Algeria, N. Africa, 65 m. s.w. of Constantine; has remains of the Roman colony founded by Trajan after his victories over the Parthians.

Thamiris, a Greek poet of legendary age, and a native of Thrace. He ventured to think that he could excel the Muses in

service. The name came to be applied to the larger landowners, and the title became hereditary. After the Norman conquest the thames were for the most part merged in the order of knights. In Scotland the thane was a heritor under the crown, and the name is found as late as the 15th century.

Thanet, ISLE OF, Kent, now a peninsula, 10 m. by 6 m. On the coast are Margate and Ramsgate, and in the district are Ebbsfleet, the landing-place of St. Augustine, and, traditionally, also of Hengist and Horsa; and an early Saxon cemetery at Osen-gall, west of Ramsgate.

Thanet Sands, the lowest subdivision of the Eocene, and the



Old Stairs is called the Pool. Length, 225 m. During the summer the Thames is a favourite holiday resort, house-boats being frequently the temporary homes of pleasure-seekers; and regattas are held at Henley, Kingston, and other places.

Thames. See GRAHAMSTOWN. **Thames Conservancy**, a body corporate, constituted in 1857, now consists of thirty-eight members, representing councils of counties bordering the river, the City of London, ship and boat owners, and various administrative bodies. It has jurisdiction over the entire waterway and foreshores. Its powers include care of the navigation, administration of the harbour and provision of moorings,

song, and was punished with blindness for his presumption. See Homer's *Iliad*.

Thana, chief tn., Thana dist., Bombay Presidency, India, on the E. coast of Salsette I., 22 m. N.E. of Bombay. Under the Portuguese it was a place of importance. It was taken by the British in 1774. It has a fort, a Roman Catholic cathedral, and a jail. Pop. (1901) 20,107. The district, which includes the island of Salsette, has an area of 4,243 sq. m., and a population of 811,433.

Thane, an old English order of nobility which stood between that of the *eorls* and that of the *eorlts*. The thanes held their title from the king, to whom originally they owed personal

base of the Tertiary strata in Britain. They are best seen in the Isle of Thanet, and extend westwards under London. They rest directly on the Chalk, and a considerable number of fossils have been obtained from them, including *Ostrea bellerophon*, *Scaloria Bowerbanki*, *Corbula regulensis*, and a 'royal fern,' *Osmundites Dowkeri*.

Thanksgiving Day, an American holiday, kept as a thanksgiving for the mercies of the year, on the last Thursday of November. The festival is actually a harvest thanksgiving, and perhaps owes its origin to the Pilgrim Fathers, who first set apart a day in America for that purpose at Plymouth, in 1621. Since

1863 the present date has been adopted throughout the states.

Thann, tn., Alsace-Lorraine, Germany, 13 m. by rail W.N.W. of Mülhausen; has manufactures of cotton, silk, and machinery. The 14th-century church of St. Theobald is a fine Gothic building, with a spire, 266 ft. high. Pop. (1900) 7,618.

Thapsacus, ancient tn. on the r. bk. of the Euphrates, commanded the most important crossing of the upper Euphrates. It may be identical with the Tiphah of 1 Kings 4:24.

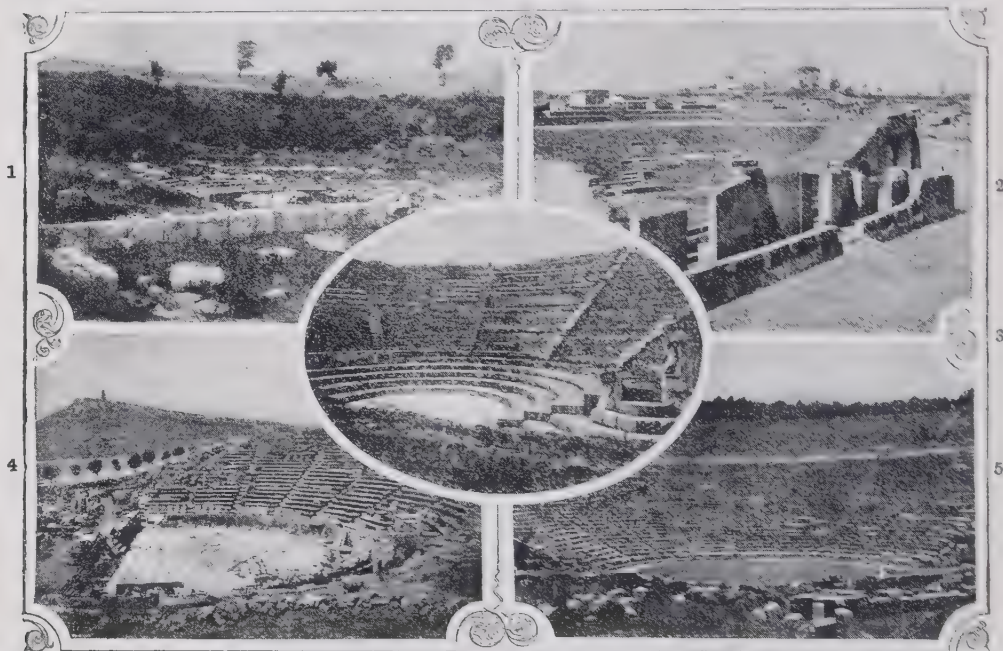
Thar and Parkar, dist. in E. of Sind, Bombay Presidency,

Persians in 492 B.C. After the Persian wars Thasos joined the Delian League, but revolted in 465, and was conquered by Athens after a two years' siege. After 405 Thasos was for some time dependent on Sparta, but for most of the 4th century B.C. it was again subject to Athens. Later it was under Macedonian rule, but in 197 was made a free state by the Romans. After the fall of the Eastern empire it was for some time possessed by Venice. The island is mountainous, and not fertile. Area, 168 sq. m. Pop. 6,000.

Thaumatrope. See ZOETROPE.

popular with the commons by attacks on the nobles, and eventually made himself tyrant (c. 640 B.C.). He was, however, expelled before his death. (2.) Of Thasos, a famous wrestler, who won no less than 1,300 crowns, one at Olympia in 480 B.C.

Theatines, a religious brotherhood, founded in 1524 by Bishop Caraffa of Theate (Chieti), Cajetan, Paul Consiglieri, and Bonifazio di Colle. Caraffa, afterwards Pope Paul IV., was the first superior. He was succeeded in 1527 by Cajetan, to whom the brotherhood owed much of its enthusiasm.



Ancient Theatres.

1. Megalopolis. 2. Pompeii: Teatro Grande. 3. Pompeii: Il Teatro Coperto. 4. Temple of Dionysus. 5. Epidauros.

India, with an area of 12,729 sq. m. It consists of two parts—the Thar, or desert; and Parkar, or the E. Nara, a well-watered plain. Pop. (1901) 363,894. The administrative headquarters are at Umarnot.

Tharawadi, dist., Lower Burma, with an area of 2,814 sq. m., and a population (1901) of 395,570. The administrative headquarters are at Tharawadi (pop. 6,030), 68 m. N.N.W. of Rangoon.

Thasos, isl. in N. of Aegean Sea, only a few miles from the Thracian coast. It was occupied first by Phenicians, and was colonized by Parians about 650 B.C. Its great attraction was its gold mines. It was conquered by the

Thaxter, CELIA (1836-94), American poet, born in New Hampshire. Politically disappointed, her father retired to the post of keeper of White Is. lighthouse on the Isles of Shoals. The solitude, the sky and sea and seaweeds, his finely susceptible daughter learned to take home to her heart and reproduce tellingly in books such as *Isles of Shoals* (1873), *Poems* (1874), *Driftwood* (1878), *Island Garden* (1894).

Thayet-myo, chief tn. in Thayet-myo dist., Lower Burma, on r. bk. of Irawadi, 38 m. N.W. of Promé. Pop. (1900) tn. 13,215, dist. 239,706.

Theagenes. (1.) Of Megara in ancient Greece; made himself

Theatre. (1.) *Greek*.—The drama arose about 560 B.C. in Attica, and it was there that the earliest theatres were constructed. They were at first of wood, but owing to a collapse of the benches in 499 B.C. it was resolved at Athens to erect a permanent stone theatre. This was the theatre of Dionysus. The building still exists, though it has been reconstructed. It consists of three parts—the orchestra, the stage buildings, and the auditorium. Of these the orchestra, or 'dancing-ground,' is the oldest, dating from the time when simply choric songs were sung without any dramatic action. It was circular in shape, but the stage

buildings projected over it to the extent of usually one-seventh of its diameter. In the centre was the altar of Dionysus. The orchestra was occupied solely by the chorus. Behind it rose the stage buildings, the Greek name for which was *scene*, literally 'a booth,' recalling the early days of the drama when a rude booth was erected behind the orchestra as the actors' dressing-room. These stage buildings were usually a long, narrow rectangle, facing the audience; the most ancient one at Athens was fifty-five yards long and only eleven yards deep. But then little scenery was used. In front the buildings resembled a palace or

rose one above another—there were over a hundred rows in the centre of the theatre at Athens—divided vertically by passages for access, and in many cases horizontally also by other passages. The lowest row of seats at Athens is of marble, and was reserved for persons of distinction, chiefly priests; the rest are of ordinary stone. The total seating accommodation is calculated at 27,500. The theatre was open to the sky; attendance at it was a religious observance; performances took place only at a few festivals, and practically the whole population was present. Yet the acoustic properties of these Greek theatres are so ex-

tained from the extreme wings of a Greek theatre. Again, the seats were built up of masonry, not excavated out of a hillside. Lastly, the theatre could usually be covered in by an awning, being in most cases of less size than the Greek. Good examples of Roman theatres are to be seen at Pompeii. See Haigh's *Attic Theatre* (1898), Frazer's *Pausanias* (1898), Donaldson's *Theatre of the Greeks* (8th ed. 1859), Hermann's *Griechische Antiquitäten* (ed. 1882-92), and Ramsay's *Roman Antiquities* (1848).

(3.) *Modern.*—In the middle ages no theatres were built, as dramatic performances were either under the direction of



Old London Theatres.

1. The Globe Theatre, Southwark. 2. The Swan on the Banks in 1614. 3. Interior of the Red Bull Theatre. 4. Sadler's Wells, 1792. 5. The Fortune Playhouse, 1811.

a temple. There were usually three doors opening on to the stage, which was a wooden platform, standing ten or twelve feet above the orchestra. On it the actors appeared; but some authorities hold that they, as well as the chorus, performed in the orchestra, and that the stage was only used for theatrical appliances. The view is, however, improbable. The auditorium was of great extent; in almost every case theatres were constructed on the slope of a hill, so that a natural substructure for the seats was provided. The shape of the auditorium was semicircular. Tiers of seats

cellent that words spoken on the stage can be heard at any part of the auditorium. Besides the theatre at Athens, those of Epidaurus, Megalopolis, Delphi, and Syracuse may be mentioned.

(2.) *Roman.*—The Roman theatre was simply a copy of the Greek, with structural alterations. In the first place, there was no chorus, and the orchestra was occupied by seats for the leading citizens. As a consequence the stage was enlarged. Further, as the orchestra ceased to be the centre of interest, the auditorium was constructed so as to give every spectator a view of the stage, which was scarcely ob-

the church and performed in the church, or were carried on by strolling players in temporary booths. In the 16th century the classical theatre was again revived in the north of Italy, and gradually developed into what may be termed the modern form, the principal characteristics of which are the great depth of stage, with sloping floor, the sloping floor of pit, and the galleries over each other, and in a horseshoe form instead of semicircular. The theatre of La Scala at Milan, built in 1774, is an early example. In later times have developed the opera house, with the galleries divided into stalls

instead of the continuous seats; and the variety theatre, with its promenade or parterre. One of the latest ideas is to do away with the columns supporting the galleries, which is now possible, to a considerable extent, by the adoption of steel construction, substituting deep girders of considerable span built in the thickness of the floors, and supporting cantilevers projecting to the front of the galleries; hence called cantilever theatres. The stage part of the theatre is often more than twice as high as the part seen by the audience, and has also a deep cellar below to admit of the scenes being raised or lowered without rolling, while the stage has an arrangement of slides and traps through which other accessories may be raised, for which purpose elaborate machinery is provided. Contiguous to the stage are suites of dressing rooms, workshops, scene-painters studio, scene docks, wardrobe rooms, and the green room.

Laws relating to Theatres.—Theatres are licensed under the Theatres Act, 1843, by the lord chamberlain within his district, and outside his district by the justices, whose powers have been transferred to county councils by the Local Government Act, 1888, and the Local Government (Scotland) Act, 1889. The lord chamberlain's district includes the old parliamentary boroughs of London, Westminster, Finsbury, Marylebone, the Tower Hamlets, Lambeth, and Southwark, and all places where the sovereign occasionally resides. Within the precincts of the universities of Oxford and Cambridge, and within fourteen miles of the city of Oxford or the town of Cambridge, a licence requires the consent of the chancellor or vice-chancellor of the university. No new stage play may be acted for hire in Great Britain without the licence of the lord chamberlain, which may be refused in the public interest. There is a daily penalty of £20 for keeping an unlicensed theatre, of £10 for acting in an unlicensed theatre, and of £50 for acting an unlicensed play. A theatre is entitled to a licence to sell liquor at a cost not exceeding £20.

Théâtre Français. See COMÉDIE FRANÇAISE.

Thebaine, $C_{19}H_{21}NO_3$, is an alkaloid present in opium. It is coloured red by concentrated sulphuric acid, and is very poisonous, causing severe convulsions by its action on the spinal cord.

Thebarton, suburb of Adelaide, S. Australia, $1\frac{1}{2}$ m. S.W. There are chemical works, tanneries, wine cellars, tweed blanket factories. Pop. (1901) 7,000.

Thebes (*Ta Apt*), anc. Egyptian city, beside the Nile, in 26° N. lat., opposite Karnak and Luxor. Its ancient names were Uast, Nu, Hat-Amen, and Pa-Hathor; to the Greeks it was known as Diospolis Magna and Pathyris, and to the Copts as Tâpê, which became corrupted into Thebes. In the Old Testament it is called No and No-Amon. It existed in the eleventh dynasty. So great was its power that it was capable of furnishing 20,000 chariots fully manned. It was the favourite residence of the Pharaohs, and the seat of the government during many centuries; and it was not until the rise (1100 B.C.) of Tanis and Bubastis, and subsequently Sais, that its magnificence and power began to decline. In B.C. 665 the satraps of Assur-bani-pal, king of Assyria, succeeded in leveling it to the ground, destroying many of its temples, and carrying captive its inhabitants. Two of its great obelisks they took away to Nineveh. Ptolemy Lathyrus besieged Thebes for three years, and gave it its final death-blow, and the city was then degraded from 'the metropolis,' and in Strabo's time it was merely a congeries of villages. At the present day the glory of Thebes consists in its ancient temples. Of these the best known are the El Kurna, the Ramesseum and Medinet-Abu temples, founded by Seti I., Rameses II., and Rameses III. respectively. To Amenophis III. are ascribed two temples on the west side of the city, as also the well-known temple at Luxor. The remarkable temple at Karnak, originally founded in the 12th dynasty, owes much of its magnificence to the additions made by later kings. The Dayr-el-Bahri, or temple of Queen Hatasu, is also worthy of note. Recent research has added to the list of those ancient monuments, and conspicuous among the achievements of those who have taken an active part in the explorations of them are the works of Naville, Hall, Davis, and Flinders Petrie.

Thebes (Gr. *Thebæ*), the chief city of Boeotia in ancient Greece, was situated on a plain encircled by lofty mountains. Its citadel was the rock called the Cadmea, to which the modern town is now restricted. There are practically no remains of ancient buildings, though the site of the ancient walls and gates can be traced. The foundation was attributed to Cadmus, an immigrant from Phoenicia, though another story makes Amphion and Zethus its founders; and the story of a Phœnician settlement is scarcely credible. Cadmus is supposed to have brought the Phœnician alphabet

into Greece. Other stories of legendary Thebes are those of the Sphinx, Œdipus, and his family, and of the two expeditions of seven heroes against the city. The first historical fact is that the early inhabitants were supplanted, or at any rate overpowered, by Boeotian immigrants, about 1100 B.C. These invaders formed a confederacy, of which Thebes was the head. The city scarcely appears in history again until about 506 B.C., when she fought with Athens for having made an alliance with Plataea. In the Persian wars she took the side of Persia, and was severely punished after the Greek victory. For the next century she was allied with Sparta, though from 437 to 447 she was subject to Athens. In the Peloponnesian war the Thebans were the bitterest enemies of Athens; but soon after its close they joined the Athenians in 394 B.C. in fighting against Sparta. In 382 the Spartans placed garrisons in Thebes and other Boeotian towns; in 379 Pelopidas freed his country, and the battle of Leuctra in 371 made it for a short time the most powerful state in Greece. Allied with the Athenians, the Thebans were defeated by Philip at Charonea in 338, and Thebes was garrisoned by Macedonians. On his death (336) it revolted; but Alexander the Great at once put down the revolt, and utterly destroyed the city, sparing only the temples and the house of Pindar. Cassander restored the city in 315 B.C., but it was of little importance afterwards. In 1311 A.D. it was destroyed by the Catalan mercenaries of the Duke of Athens. Its population is now about 3,200.

Thecla, a saint, who is the heroine of the romance *The Acts of Paul and Thecla*, which is among the oldest of the apocryphal writings. Though it was discredited as fact (Tertull., *De Bapt.*, 17), the story was very popular. Thecla herself was, it is generally acknowledged, a real person, a member of a noble family of Iconium in Lycaonia. Another Thecla, or Tecla, is a British saint of the 8th century; she was a member of the mission to Germany, of which Winifred, or 'Boniface,' was the founder and head.

Theed, WILLIAM (1804–91), English sculptor, born at Trentham, Staffordshire, executed the *Africa* group on the Albert Memorial in Hyde Park; also statues of the Prince Consort, of Peel, and of Sir Isaac Newton.

Theft, in the widest sense, means the act of wrongfully depriving another of his property, either by taking it or withholding it from him. But in this

sense it extends far beyond the common law notion of theft (or larceny, as it is called in England), even as extended by statute, and includes not only the aggravated and violent form of theft called robbery, but also such special offences as cheating, embezzlement, and fraudulent breach of trust. In the narrower sense of the common law, to constitute a theft there must be a wrongful taking of goods which, in the eye of the law, are in the possession of another, accompanied by the intention of wrongful appropriation, or *animus furandi*. To take a thing out of the possession of another without his consent is a trespass. If the trespass is accompanied by an *animus furandi*, it is also theft. If the taking is authorized by law, as in the case of a distress for rent, or the seizure of goods by a sheriff under an execution, the trespass is protected so long as the authority continues and is followed. But if the authority comes to an end and possession is retained, that is a trespass; and if at any time the goods are misappropriated *animus furandi*, that is theft. If the authority is abused, the law treats it as never having existed, and the person in possession of the goods becomes a trespasser *ab initio*, and is liable to an action for damages for the original taking of the goods; but there is no theft without an *animus furandi*, and this can only be proved by some act of misappropriation. If the taking is not authorized by law, but is not accompanied by an *animus furandi*, it is a continuing trespass, and becomes theft if at any time an *animus furandi* supervenes and is proved by an act of appropriation. This is illustrated by a well-known case, in which the facts were these:—A man drove a flock of twenty-nine lambs belonging to him out of a field in the early morning, and by mistake drove along with them one lamb belonging to another man. Four days afterwards he offered the lambs for sale as twenty-nine lambs; but the purchaser observed there were thirty, and the accused then sold the prosecutor's lamb with his own and kept the price. He was convicted of theft (Riley's Case, 1853). If there is no 'taking without the consent' of the possessor, by the common law there can be no theft, so that in a case of bailment, as when goods are lent to a friend to be used for a limited period, the bailee did not commit theft though he appropriated the goods and sold

them; but this has been made theft by statute.

The legislature has never attempted a wider definition of theft, but has created a number of special offences to meet cases which fell outside the common law definition. Thus by the common law theft could only be of purely personal chattels, such as money or goods, capable of possession, and of some intrinsic value. But by the Larceny Act, 1861, fixtures, materials of buildings, minerals, trees, plants, title deeds, valuable securities, wills, deer, dogs, and all birds, beasts, or other animals ordinarily kept in a state of confinement, or for any domestic purpose, are all made capable of being stolen.

Theft was formerly punishable with death, but now it is a felony, punishable with penal servitude up to five years or imprisonment for two years. Some thefts are misdemeanours under the Larceny Act, and may be punished by fine or imprisonment, and sureties for good behaviour may be required. The theft of a will is punishable with penal servitude for life; and so also are thefts of letters containing money or valuable securities by employes of the Post Office, and thefts of money or securities by employes of the Bank of England or of Ireland. Thefts of horses and cattle, thefts from the person or in a dwelling-house, and thefts from ships, wharves, havens, etc., and from vessels in distress, are punishable with fourteen years' penal servitude.

In Scotland, as in England, the common law has been extended by statute to include many acts which would not otherwise be theft; and the law is very much the same in both countries, though there is no consolidating act in Scotland. One difference, which may be noticed is that by Scots law there can be theft of children, under the name of 'plagium.' Technical difficulties as to the exact nature of an offence are largely got rid of by section 59 of the Criminal Procedure Act, 1887, which makes most crimes of dishonesty interchangeable, so that a person indicted for robbery, or theft, or breach of trust and embezzlement, or falsehood, fraud, and wilful imposition, may be convicted of reset; or if indicted for robbery, or breach of trust and embezzlement, or falsehood, fraud, and wilful imposition, may be convicted of theft; or if indicted for theft, may be convicted of breach of trust and embezzlement, or of falsehood, fraud, and wilful imposition, or may be convicted of theft although

the circumstances proved may in law amount to robbery. See also LARCENY and ROBBERY.

Authorities: Pollock and Wright on *Possession in the Common Law* (1888); Sir W. O. Russell on *Crimes* (1896); Stephen's *History* (2nd ed. 1890) and *Digest of Criminal Law* (6th ed. 1904); Macdonald's *Criminal Law of Scotland* (3rd ed. 1894).

Theine. See CAFFEINE.

Theiner, AUGUSTIN (1804-74), German Roman Catholic historian, born at Breslau. He entered the priesthood, and in 1855 was placed in charge of the Vatican archives, from which he was removed in 1870, probably on suspicions of his orthodoxy. Among his works are an edition of the *Annals* of Baronius (1864, etc.), volumes on the ecclesiastical history of several countries, and *Geschichte des Pontificats Clements XIV.* (1853).

Theism, a name adopted by some religious thinkers in the 19th century—Theodore Parker, F. W. Newman, W. R. Greg, Miss F. P. Cobbe—who, while agreeing with the deists of the 18th century in rejecting Christianity as a revelation, and appealing with them to reason (or intuition), aim at establishing belief in an immanent God within nature, rather than a God outside it. A short account and criticism of their (varying) views will be found in Dr. A. B. Bruce's *Apologetics*. More usually, theism is employed as a synonym with natural theology to denote that part of religious belief which reason can prove, in the opinion of those who accept revelation as well as reason. Attention is usually concentrated on the proofs for the being of God. (1.) The oldest and most popular proof is the teleological. As it is put, design (better, adaptation) implies a designer. The most striking examples of adaptation are found in living organisms, particularly in the region of sex: for example, a mother's milk is adapted, and surely intended, for the nourishment of newly-born offspring. Empiricist philosophy can use this argument; hence it is the central point in Paley's *Natural Theology*. Even if we are dependent upon experience for all our knowledge, still the experienced facts of adaptation seem to prove a designing mind. Two great objections have been taken to the argument. One is Kant's: If it holds good at all, it proves a limited being, working on given materials and making the best of them—not an infinite God. This objection has not much troubled English thought. In England it is the theory of evolution, heralded by Darwin's work, that has brought the design ar-

gument into disfavour. Adaptations in living creatures are not due then to creative mind, but to some blind mechanical power such as natural selection and survival of the fittest—so it is argued. Plainly, evolutionism negatives belief in special creation. But does it destroy teleology? Is it more than a process? Does not the process imply a reason working through it? In the light of evolutionary belief, man's moral discipline appears as the 'one far off divine event to which the whole creation moves.' And thus evolutionism helps teleology.

(2.) The cosmological argument points to God as the great First Cause, in contrast with whom all finite agencies are styled 'second causes.' This argument is not available for empiricists—we have never seen universes amaking—but it appeals strongly to intuitionists. If we know by intuition that every effect has a cause, then 'nature' must be 'the name of an effect whose cause is God.' (See Professor Flint's *Theism*, ed. 1889, and *Anti-Theistic Theories*, 1877; Martineau's *Study of Religion*, 1889.) Kant objects that a First Cause—a cause which is not an effect—is in contradiction to the alleged intuition (*cf.* the child's question, 'Who made God?'). Formally, it must be an error to speak of a First Cause; but if we trust thought at all, we must believe in one great central system or force. Herbert Spencer's doctrine of the Unknowable is itself a kind of theism.

(3.) The ontological or *a priori* proof infers God's existence from the very thought of a perfect or self-existing being. Such an argument states, in scholastic guise, the core of idealistic philosophy such as Hegel's, which is penetrated through and through by faith in the trustworthiness of thought. Non-idealists will always fight shy of the argument. Canon Rowe's *Christian Theism* (1878), a good, popular book, omits it; so also does Martineau. Flint and others rely on it as warranting belief in God's infinity. Samuel Clarke's argument for a kindred purpose is not strictly an *a priori* proof—one from the very nature of thought.

(4.) The moral argument was Kant's substitute for the proofs he rejected, giving practical certainty of God. Such an attitude is characteristic of the theism of Christian agnosticism (*cf.* Sir W. Hamilton's *Lectures on Metaphysics*). Others may hold that the design argument, if duly restated (see above), covers the ground of the moral argument. Flint uses the moral argument

to prove the moral nature of God. But he also accepts the ordinary intuitionist form as a proof of God's being—(moral) 'law implies a lawgiver.'

The Gifford Lectures and Burnett Lectures deal with theism. No better introduction to a philosophical treatment can be found than in Campbell Fraser's treatise (*i.e.* his Gifford Lectures). Lotze's discussions—most briefly given in *Outlines of Philosophy of Religion* (ed. 1892)—have deeply affected theistic thought.

Theiss (Hung. *Tisza*), Hungarian river, rises as the Black Theiss and the White Theiss in the county of Marmaros, in the N.E. Carpathians, and flows w., s.w., and s., past Tokaj, Szolnok, Csongrad, and Szegedin, to join the Danube on the l. bk. near Titel, after a course of 625 m. The first part of its course is rapid and clear; but when it enters the great Hungarian plains it becomes sluggish and extremely tortuous, and, especially prior to the construction of extensive embankments (suggested by the inundation of Szegedin in 1879), frequently liable to flood the country and to alter its course. The chief tributaries are the Szamos, Körös, Maros, Latorcza, and Sajó. It is navigable by steamers to Tokaj; but Tisza-Füred is considered the limit of navigation. The Franzen (Francis) canal connects the Lower Theiss with the Danube. Fish, formerly abundant, are rapidly diminishing in number.

Thelemark, dist., Bratsberg co., Norway, is covered with mountains, which culminate in Gausta (6,200 ft.), where the waterfall Rjukan is. The region is rich in lakes, and is one of the most picturesque parts of Norway.

Thellusson, PETER (d. 1797), banker, of Swiss origin, settled in London (1750), and left a will which afterwards became the subject of an Act of Parliament (1800). Its gist was that £4,500 a year in addition to £600,000, should be allowed to accumulate during the lives of his sons and of their sons, and then be used to purchase an estate for his eldest great-grandson. In 1856 the last of his grandsons having died, the property was awarded to the eldest grandson of his oldest son; but this was contested, and the legal expenses were so great that the inheritance was not larger than in 1797.

Thellusson Act. See ACCUMULATION.

Thelwall, JOHN (1764–1834), English reformer, born in London, became a journalist about 1787. He took great interest in the ideas of the French revo-

lution, and was a demagogue orator; was befriended by Horne Tooke; and, in 1791, became a member of the Society of the Friends of the People. He was tried for high treason, but was acquitted (1794). After 1798 he withdrew from political agitation and became a teacher of elocution, and professed to cure stammering.

Themis, in Greek mythology, a daughter of Uranus and Ge, and wedded to Zeus, to whom she bore the Horæ (seasons), Eunomia (Lawfulness), Dice (Justice), Eirene (Peace), and the Moiræ (Fates). Themis personifies law and order; she was also worshipped as a goddess of prophecy. Thebes, Athens, Olympia, Tanagra, and Troezen were seats of her worship.

Themistius (c. 310–390 A.D.), Oriental philosopher and rhetorician, was a native of Paphlagonia, but lived chiefly at Constantinople after 347 A.D. He was made senator and prefect of Constantinople (362), besides sharing in important embassies. In philosophy he was a close student of Aristotle, of whose works he wrote paraphrases. These and some *Orations* are extant. Editions: Paraphrases and Eight Orations, Aldus (1534); Orations, Dindorf (1874); complete text, Spengel (Teubner Series, 1866). See E. Baret's *De Themistio Sophista* (1853).

Themistocles (c. 530–460 B.C.), Athenian statesman, archon in 493 or 492 B.C., when he persuaded the Athenians to make the Piræus their port instead of Phaleron. He fought in the battle of Marathon (490), and in the following ten years was the most influential politician at Athens. In 483 or 482 he persuaded the Athenians to build a fleet of two hundred warships, which proved the salvation of Greece in the Persian war of 480 B.C. When the Persians forced the pass of Thermopylæ and Attica was thus open to the invaders, the Athenians *en masse* took refuge in Troezen, Egina, and Salamis, at the instigation of Themistocles. He was responsible for the decisive Greek victory at Salamis. When he saw that Eurybiadas, the Spartan commander, was about to yield to the Peloponnesian captains, who wished to retreat, he sent a trusty slave with a message to Xerxes that the Greeks proposed to flee. Xerxes therefore sent two hundred ships to close the western exit of the bay, and so the battle became inevitable. The resulting victory was a personal triumph for Themistocles. In 478 or later he secured the rebuilding of the walls of Athens, and completed the fortification of the Piræus.

He also thwarted Sparta about 476 by preventing the passing of her proposal that those states—especially Thessaly and Thebes—which had joined the Persians should be excluded from the Amphictyonic League. Themistocles had, however, no definite party to support him, and about 472 B.C. he was ostracized, though the exact causes of his ostracism are unknown. He then resided at Argos; but when Pausanias was found guilty of intriguing with the Persians, the Spartans found that Themistocles also was implicated, and reported his treason at Athens. The Athenians sent men to arrest him; but he escaped, first to Corcyra, then to Admetus, king of the Molossians, who refused to give him up; he was then outlawed and his property confiscated. Finally he reached the Asiatic coast, where he lay in hiding until the death of Xerxes (464 B.C.); then he went up to the Persian court, and presenting himself to Artaxerxes, promised him his aid in conquering Greece. The king gave him the government of Magnesia, where he died.

Themistocles was one of the greatest geniuses of Greece. From his foresight and decision, he was unequalled in devising counsels on an emergency. He certainly was the saviour of Greece from Persia, and he was the founder of the greatness of Athens as a sea power. Other aspects of his character—his lack of scruple and greed of gain—are less admirable; but it is probable that many of the stories which illustrate these defects are the fictions of his foes, for he was never popular. *Lives* by Plutarch and Cornelius Nepos.

Thénard, Louis Jacques (1777–1857), French chemist, born in dep. Aude; studied under Berthollet, and was professor of chemistry at the Ecole Polytechnique (1810) and Collège de France (1804). He worked with Gay-Lussac and Liebig in elucidating the composition of several important chemical compounds, and improved the process of manufacturing white lead. His chief works are *Traité de Chimie Élémentaire* (6th ed. 1836) and *Recherches Physico-chimiques* (1811).

Theobald, Lewis (1688–1744), English Shakespearean critic, was born at Sittingbourne, and pursued a literary career. In 1726 he gained notice by his *Shakespeare Restored, or a Specimen of the many Errors committed as well as unamended by Mr. Pope in his late edition of this Poet*, which brought upon the author Pope's scathing satire. Theobald gained lasting fame by the publication, in 1733, of his edition of Shakespeare in eleven volumes.

Theobalds, seat, Hertfordshire, England, 1 m. w. of Waltham Cross Station. The former mansion was built by Lord Burghley, who here entertained Queen Elizabeth on several occasions. It was afterwards acquired by James I., who died here. Temple Bar has been re-erected at one of the gates.

Theobroma, a genus of tropical American trees belonging to the order Sterculiaceae. They usually bear large drupes with woody stones. Much the most important species is *T. cacao*, the cacao or cocoa plant.

Thebromine, dimethyl-xanthine, $C_7H_8N_4O_2$, is the active principle of the cacao or cocoa bean, from the tannin free residue of which it can be extracted by alcohol. It is a crystalline powder, with a bitter taste, and closely resembles caffeine. It is occasionally employed as a diuretic in heart troubles.

Theocritus (c. 310–265 B.C. or later), Greek pastoral poet, was most probably a native of Syracuse in Sicily. From about 290 to 283 B.C. he was intimate with the poet Philetas in Cos and with his friends the poets Nicias, Asclepiades, Alexander, and Leonidas. The next eight years he seems to have lived in Sicily. From 274 to 270 he was in Alexandria, where he formed a friendship with Callimachus, and was poet laureate at the court of Ptolemy II. After that he lived at Cos, and visited Miletus. Theocritus was the father of bucolic poetry as a branch of Greek literature; all later writers in the same style—such as Virgil in Latin poetry, Spenser and Milton in English—have imitated him. But his countrymen are real rustics, not courtiers or scholars masquerading as shepherds; and his country scenes are true to life—not merely to the life of his day, but to that of the shepherds of S. Italy and Greece even now, only he depicts the happier side of country life. But only ten of his idylls are strictly bucolic; others depict character scenes of various kinds with great dramatic force; the fifteenth is famous for its representation of life in Alexandria, the second for its portrayal of the hopeless passion of a disappointed woman. Others are epic or lyric in character. His language is Doric Greek, and he is famous for the sweetness of his rhythm and style. Of the thirty idylls ascribed to him some are undoubtedly not his work—e.g. xviii. to xxi., xxiii., xxv., and xxvii.; there are also extant some epigrams, and a poem called *Megara*, which are probably his work. Editions: Text—Ziegler (1879); with notes—Cholmeley (1901), Fritzsche and Hiller (1881).

English translations: verse—Calverley (1869), Hallard (1894); prose—Lang (1889).

Theodectes (c. 376–335 B.C.), a native of Phaselis in Lycia, who spent most of his life at Athens; was famous in the fourth century B.C., both as a rhetorician and as a tragic poet. He was a pupil of Isocrates, and, it is said, also of Aristotle. His plays were fifty in number, and he gained eight victories in the dramatic contests. Only fragments of his plays survive, and his rhetorical works are completely lost. See Mærcker's *De Theodectis Vita et Scriptis* (1835).

Theodelinda (end of 6th and beginning of 7th century), queen of the Lombards, daughter of the Duke of Bavaria; she chose (590) for her second husband the Duke of Turin, accepted by all the Lombards as king in Milan. The Lombards were Arian Christians, but through Theodelinda's influence her husband became Catholic. Her crown and other relics are still in Monza cathedral.

Theodicy, the vindication of the attributes of God, specially His justice and reason, in relation to an imperfect world, manifesting both physical and moral evil. Leibniz in his *Theodicæ* (1710) regards the present as the best of all possible worlds. See OPTIMISM.

Theodolite, the most important of all instruments used in land-surveying. Its purpose is to measure angles, both in the horizontal and vertical planes. It is, therefore, a form of al azimuth instrument, and is essentially a telescope mounted so as to be capable of two quite independent movements of rotation, the one about a vertical axis and the other about a horizontal axis. Both movements are measured by suitable graduations on the rims of circular arcs or plates. The instrument when in use rests upon a tripod stand, and is carefully adjusted by means of levelling screws. The vertical angles are measured by means of a graduated semicircular arc which is in rigid connection with the telescope. The horizontal angles are measured by means of the graduation on the lower horizontal circular plate, which during any one series of observations is clamped in position to the stand, but which may by rotation about a vertical axis be set so as to have its zero of graduation in any desired azimuth. Over the 'lower horizontal' moves the concentric and slightly smaller 'upper horizontal' circular plate, which is rigidly attached to the frame supporting the telescope. The rim of the upper horizontal is marked with an index point and a vernier graduation, which slides round in close con-

tiguitly to the graduation on the lower horizontal. The fine adjustment is accomplished by means of a tangent screw after the upper horizontal plate has been clamped in approximate adjustment to the lower plate. The graduation on instruments made in Britain is in ordinary degrees of ninety to the quadrant. But in recent years theodolites have been made in France with the centesimal division of 100 grades to the quadrant. There is no doubt that for land-surveying purposes the centesimal graduation is greatly superior to the old historic method.

Theodora (d. 548), wife of the Roman emperor Justinian, was

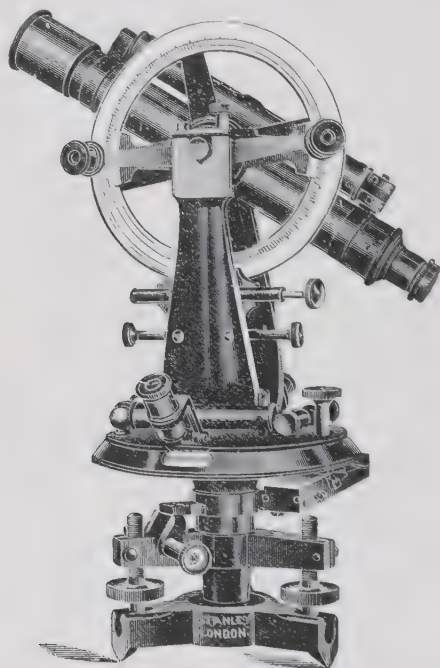
Florence a few Corsican patriots invited him to place himself at the head of a Corsican insurrection against Genoa. With help obtained from the Porte and the bey of Tunis, he was for a time successful, and was proclaimed king of Corsica (1736), but he was driven out by the Genoese (1738). An attempt to re-establish his power failed (1743).

Theodore of Abyssinia. See ABYSSINIA.

Theodore of Mopsuestia (c. 350–428), exegete of the Antiochian or Liberalist school, and a pupil of Diodorus of Tarsus, was born at Antioch. He became a presbyter in his native city (383), and (393) bishop of

Theodoret (c. 390–457), exegete, preacher, and church historian, born at Antioch. About 423 he became bishop of Cyrus, or Cyrrhos, in the Euphratensis. In his commentaries on the prophets, Psalms, and Pauline epistles he follows the methods of Theodore of Mopsuestia. His *Church History* continues Eusebius's till 428 A.D., and he wrote also a *Historia Religiosa*. His other works include a treatise on heresy, an apology for Christianity, the *Eranistes* (a refutation of the teaching of Cyril), numerous letters of great historical importance, and of ten orations on Providence. His *Church History* appears with that of Evagrius in Bohn's library (1851–4). See Specht's *Theodore of Mopsuestia and Theodoret* (1871).

Theodoric. (1.) King of the Visigoths from 418 to 451 A.D., was probably the son of Alaric. From 425 to 440 he was often at war with Rome, and was usually successful; but in the latter year he made a lasting peace with the Romans. In 451, while aiding Aetius, the Roman general, against Attila, he fell in the great battle of Châlons-on-the-Marne. (2.) Second son of the above, was king of the Visigoths from 452 to 466 A.D. He was murdered by his brother Euric. He was a patron of literature; Sidonius Apollinaris visited his court. (3.) **THEODORIC THE GREAT** (455 to 526 A.D.), king of the Ostrogoths, was born at Vienna, but was educated up to the age of eighteen at Constantinople, where he had been sent ten years before as a hostage. In 475 he became king. For some time Theodoric was a loyal ally to the Emperor Zeno; but in 487 he marched on Constantinople. To save himself, Zeno gave him leave to invade Italy and expel the usurper, Odoacer. Theodoric accordingly entered Italy in 489; and after three defeats of Odoacer, and having besieged him for three years (490–493) in Ravenna, he agreed to Odoacer's proposal that they should rule Italy conjointly. But within a few days Theodoric caused his rival to be murdered. His ensuing reign was marked by wise government. He kept his soldiers in strict discipline, and Italy soon regained great prosperity. Though an Arian, he was tolerant to Catholicism; and he patronized literature—Cassiodorus and Boethius were among his ministers. His court was at Ravenna, though he moved it to Verona when threatened by barbarian invasions. His last years were darkened by his executions of Boethius and Symmachus. He figures in legend as Dietrich of Bern. See Hodgkin's *Theodoric the Goth* (1891).



Theodolite.

a pantomimic actress and a courtesan until she was noticed by Justinian, who married her in 525 A.D.; and when he succeeded to the throne, in 527, had her proclaimed empress. See Debidour's *L'Impératrice Theodora* (1885).

Theodore (1686–1756), 'king of Corsica,' a German adventurer, the son of a Westphalian noble in the service of France, was born at Metz. He entered the French army, and later transferred his services to that of Sweden, where he was discovered by Goertz, who employed him on secret diplomatic missions. In 1735 he was made *charge d'affaires* at Florence by the Emperor Charles vi. In

Mopsuestia in Cilicia, where he died. He commented on nearly all the books of Scripture, but except his works on the minor prophets (Greek) and the Pauline epistles (in a Latin translation), only fragments remain. Opposing the allegorizing methods of Origen, with his grammatico-historical exegesis and his free handling of the canon he may be said to have anticipated the methods of modern criticism. His works were condemned at the Fifth Ecumenical Council (553). See Kihn's *Theodore von Mopsuestia und Junilius Africanus als Exegeten* (1880); Swete, in *Dict. of Christ. Biog.* iv.

Theodorus, a Greek philosopher of the Cyrenaic school, who flourished towards the end of the 4th century B.C. He was a native of Cyrene, but lived much at Athens. He was notorious for his atheism; in morals he asserted that the great end was pleasure; so-called crimes were merely branded so by public opinion, in order to restrain fools. See Zeller's *Socrates and Socratic Schools* (Eng. trans. 1877).

Theodosia, or **FEODOSIA**, a port on S.E. coast of Crimea, Russia, 65 m. E. of Simpheropol, on Bay of Kaffa, with an excellent harbour. Here are a college founded by Alexander I., and a museum, rich in local antiquities. Pop. (1897) 27,236. As 'Kaffa of the Genoese,' it was the most famous mediæval port on the Black Sea, but it had a long and prosperous existence as a Milesian colony in pre-Christian times.

Theodosius. (1.) General of the Roman empire, was, in 367 A.D. sent by Valentinian to expel the Picts and Scots, who were ravaging Britain; in two campaigns he restored peace to the island. In 373 Theodosius put down the Moorish rebellion; but in 376 he was executed at Carthage, by order of Valens, for some reason unknown. (2.) **THEODOSIUS I.** (346-395 A.D.), son of the above, was a native of Spain; in his youth he accompanied his father to Britain; after the latter's execution he lived in retirement until, in 379 Gratian, emperor of the West, invited him to fill the place of Valens, as emperor of the East, with the conduct of the war against the Goths. In 382 the Goths submitted, and bodies of them were settled in Thrace, and also in Phrygia and Lydia. Theodosius then suppressed Maximus, who in 383 had led a revolt against Gratian and then against Valentinian, Gratian's successor. In the next year he entered Rome in triumph; he spent three years in Italy, and restored Valentinian to power. Theodosius was an ardent supporter of orthodoxy against Arianism, other heresies, and paganism; in 381 he prohibited all sacrifices, in temples or elsewhere, and his last edict in 390 imposed severe penalties, in some cases death, on idolatrous sacrifices. Theodosius, in fact, was of a savage temper: in 390, to punish the inhabitants of Thessalonica for a riot, he invited them to the games of the circus, and there had them butchered to the number of seven thousand or more. (3.) **THEODOSIUS II.** (401-450 A.D.) was the grandson of the above, and son of Arcadius, whom he succeeded in 408. He was a weak ruler, being entirely under the influence of

his elder sister, Pulcheria. Wars with the Persians and Huns were the chief events of his reign, in which was put together the *Codex Theodosianus*, a compilation of the constitutions of the Roman emperors from Constantine down.

Theodule, ST., Alpine pass (10,899 ft.), beside the Matterhorn, leads from Zermatt to the Val Tournanche, an affluent of the Dora Baltea or Aosta valley.

Theognis, Greek elegiac poet, was a native of Megara, and flourished probably between 600 and 550 B.C. He was exiled by the democratic party. His poems consist of political reflections, advice on moral and social topics, and, in general, a great deal of the philosophy of daily life, forcibly expressed, though without much poetical imagination. Editions: Text—in Bergk's *Poetæ Lyrici Græci*; Sitzler (1880); with notes—Harrison (1902). See *Studies in Theognis*, by Miss Harrison (1903).

Theogony, the story of the origin of the gods of Greece; it is most fully told in the poem of Hesiod entitled the *Theogony*, which describes the origin of the powers of nature, and the manner of the birth of the gods.

Theology, a term used by Plato (*Rep.* ii. 379a), in its literal sense, and from about the 4th century taken over by the Christian fathers. In its special usage it coalesces with dogmatics. The several branches of learning which nowadays go to make a theological education are variously grouped, but the following may be found a useful synopsis:—1. Historical theology, which seeks to present the different elements and materials in their actual historical setting, subdivided thus: (a) exegetical theology, under which comes exegesis proper, with its ancillary disciplines, the Scripture tongues, introduction, history of Israel and of New Testament times; (b) church history, embracing also the history of dogma and symbols (creeds and confessions); (c) methodology, embracing criticism and hermeneutics. 2. Normative theology, the presentation of the material as existent in the faith and practice of the church, subdivided into (a) systematic theology, including dogmatics and Christian ethics; and (b) practical theology, with its various elements, liturgics (worship), homiletics (sermon), and pastoral theology (cure of souls). See Schleiermacher's *Kurze Darstellung des theologischen Studiums* (1811); Rozenkranz (1831), Hagenbach (1833; ed. 12, by Kautsch-Reischle, 1889), Rübiger (1880, trans.), Dörner (1901); Cave's *Introduction to Theology* (1886); and Davies's *Theological Encyclopædia* (1905).

Theophany, the manifestation of God to man in visible form—e.g. as the angel of the Lord (Gen. 18, etc.), or as Jesus Christ.

Theophilanthropism, a religion which was devised at Paris in 1796 to take the place of Christianity. The system disappeared in 1802.

Theophilus, the original, perhaps, of the Faust legend. He was said to have been a coadjutor bishop at Adana in Cilicia, who, being deposed by his enemies, sold himself to the devil to regain his post. The horror of his act overwhelmed him, he successfully sought the intervention of Mary, who succoured him. This legend was current in the West in the 10th century, and was made the subject of many religious romances.

Theophilus, bishop of Antioch; occupied that see in 168. He wrote an *Apology*, and is the reputed author of a commentary on the gospels, the authenticity of which has been much discussed.

Theophrastus (c. 372-287 B.C.), Greek philosopher, was a native of Lesbos; he studied philosophy at Athens, under Plato and Aristotle, who appointed him his successor in the presidency of the Lyceum. Theophrastus presided over the Lyceum for some thirty-five years, and had, it is said, 2,000 pupils; he was highly esteemed at Athens for the excellence of his character. He wrote much on all branches of philosophy; two works on botany, fragments of another on sensation, and of a third called the *Characters*, are extant. Editions: Schneider (1821), and Wimmer (Teubner Series, 1854-62). English translations of *Characters*—Jebb (1870), Bennett and Headlam (1902).

Theophylact, archbishop of Achrida, in Bulgaria (1078-1107); is the author of commentaries on the minor prophets, and on the New Testament; also of epistles and tracts. These were printed at Venice in Greek and Latin in 1754-63. His work on *The Education of Princes* was written for Constantine Porphyrogenitus.

Theopompus (c. 378-300 B.C.), ancient Greek rhetorician and historian, was a native of Chios, where he became a pupil of Isocrates. He was banished from Chios, but was aided to return by Alexander the Great in 333 B.C. Nevertheless his aristocratic sympathies made him so unpopular that he had to take refuge with Ptolemy in Egypt about 305 B.C. He wrote *Hellenicæ Historiæ*, covering the period from 411 B.C. (when Thucydides left off) to 394; and *Philippicæ*, a history of Philip's reign from 360 to 336. Only fragments of these works survive. Ancient critics com-

mend Theopompus for his painstaking accuracy, but find fault with his proneness to censure. For his fragments, see Müller's *Fragmenta Historicorum Græcorum* (1841). See Pflugk's *De Theopompi Vita et Scriptis* (1827).

Theory. (1.) Theory may be opposed to fact. By a theory we then mean the reduction of certain data or facts to a principle, or the exhibition of the facts in their true relations to each other. But the opposition is only relative; for the contrast is, strictly speaking, between facts or data whose relationship or principle is not perceived and the same facts related according to a certain principle. If, then, the theory is true as theory, and enunciates the real relationships that hold among the facts, it necessarily brings us closer to the reality than we were at first, when we had the mere unrelated data before us. (See Nettleship's *Philos. Remains*, 2nd ed. 1901, pp. 124 ff.) (2.) Theory may be opposed to practice. In this antithesis, as originally defined by Aristotle, theory or theoretical science meant the pure knowledge of the spectator—knowledge of things apart from any relation to our activity; whereas practice, or practical science, was concerned with things which can be changed by our activities. The theoretical sciences were mathematics, physics, and, above all, metaphysics. Practical science was either ethico-political science or productive art. This original meaning of the antithesis, however, has been largely obliterated in our loose and vague usage of the terms. We use the terms 'theory' and 'theoretical,' for instance, quite freely in connection with matters of practice and art; and, when opposing theoretical to practical knowledge, we have in view the contrast between abstract knowledge of principles and concrete familiarity with details quite as much as the original contrast depending on the absence or presence of the reference to human activity. The contrast which most nearly corresponds in our ordinary usage to the original contrast of theory and practice is rather that between science and art (*cf.* Mill's *Logic*, last chapter). But the original contrast is still prominent in an antithesis such as that between theoretical and practical reason.

Theosophy, an intuitive or ecstatic mode of enunciating doctrines, originated in, or at least more particularly characteristic of, India, where it is entitled *Ātmā Vidyā* (spirit science), or *Gupta Vidyā* (secret science). Buddhism is closely akin to theosophy. More or

less theosophical are the doctrines also of Zoroaster embedded in the *Rig-veda*. The doctrines of the Pythagoreans, including that of the transmigration of souls and orphic mysteries, seem to be of a theosophic tinge. At Alexandria, the meeting-place of the East and the West, the school of Philo Judeus (20–10 B.C.) united Platonic speculation with Judaism in language akin to that of theosophy. There, too, Gnosticism synthesized the traditions of Syria, Chaldæa, Persia, and blended with Judaism, Christianity, and Platonism in a strain describable as theosophic. Philo vents ecstatic utterances on the inexpressible nature of God, and how related to the sensible universe, and how ideas are realities. Basilides postulates the unknown Father from whom emanate mind, word, wisdom. Clement of Alexandria (2nd century) conceives of the Father as a pure monad manifestable only through the Son. Allying itself in the 3rd century with Platonism, theosophy gave birth to Neo-Platonism. The hermetic books of the ancient Egyptians, treating of the nature of the gods and cosmology, may be classed as theosophical. In the middle ages the Rosicrucians, dealing with the philosopher's stone, metallic transformation, control of elemental spirits, may be deemed of the theosophical succession. In modern times theosophy may be traced in Schwenkfeld, Weigel, Jakob Böhme, Swedenborg, Paracelsus, and Giordano Bruno. In 1875 was founded the Theosophical Society, with headquarters at Madras, publishing a monthly, the *Theosophist*; quarters in London, publishing the monthly, *Lucifer*; quarters in New York, publishing, monthly, the *Path*; and quarters in Germany, publishing, monthly, *Theosophischer Wegweiser*. Altogether there are about three hundred branches of the society throughout the world. The society's objects include (1) formation of the nucleus of a universal brotherhood of humanity; (2) promotion of the study of ancient and modern religions and philosophies; (3) investigation of unexplained laws of nature and psychical powers of man. Madame Blavatsky was the main instrument in the recent revival of theosophy, and Mrs. Annie Besant the leading theosophist of England; yet, in the judgment of many scholars, Madame Blavatsky was a convicted impostor. See dissertations by Sennett, Judge, Rama Prasad, and Annie Besant.

Theotocopuli, DOMENICO, known as EL GRECO (c. 1545–1625), Italian painter, architect, and

sculptor, a native of Greece, and a supposed pupil of Titian. Most of his life was spent in Spain, where he painted portraits and Biblical scenes, and designed churches and monuments. His most important structure was the church and monastery at San Domenico di Silvos.

Thera, or SANTORIN, the chief isl. of the group called the Sporades, in the Ægean Sea, 70 m. N. of Crete; area 30 sq. m. It is of a volcanic nature; a settlement of Mycenaean civilization, though of early date (c. 2000–1700 B.C.), it was overwhelmed by an eruption; its houses have been excavated, and pottery and other articles discovered. Later (perhaps about 1000 B.C.) a colony of Dorians settled in the island, which in its turn founded the colony of Cyrene about 630 B.C. The soil is very fertile; wine is the chief product. Pop. 14,500, nearly half Roman Catholics.

Theramenes, Athenian politician; took a leading part in the oligarchical revolution of the four hundred in 411 B.C., but then turned against them, and secured the overthrow of their government, and the establishment of a new constitution, limiting the franchise to 5,000 citizens. But the genuine democracy was soon restored. In 406 he accused the generals who commanded at Arginusæ of having failed to recover the dead and wounded. In 404 he negotiated terms with Sparta, after the defeat of Egospotami and the siege of Athens, and was appointed one of the 'thirty tyrants' to frame a new constitution. But again his colleagues, especially Critias, went beyond his desires in their illegalities; Critias attacked him, and had him condemned to death (404).

Therapeutæ, a Utopian sect of ascetics described in the work *De Vita Contemplativa*, the authorship of which is unknown, though it has been ascribed to Philo. The abode of the Therapeutæ was the shore of Lake Marcotis, near Alexandria in Egypt. They were akin to the Essenes in discipline, but emphasized the solitary condition of monastic life. Each occupied his cell during the week, only to meet on the Sabbath for worship. See Lucius's *Die Therapeuten* (1879).

Therapeutics, the science that deals with the measures and agents which the surgeon and physician employ to maintain or to restore health. It is concerned not only with the application of drugs, but with hygienic, dietetic, and gymnastic methods; not only with remedial measures, but with prophylaxis. In the special articles on various diseases the appropriate treatment of each is discussed.

Therapia, residential quarter and summer resort on Bosphorus, 9 m. N.N.E. of Constantinople.

Theresa, ST. See TERESA.

Theresienstadt, fort. tn., Bohemia, Austria, on the Eger, close to its junction with the Elbe, and 48 m. by rail N.N.W. of Prague. Tanning, brewing, and corn-milling are the chief industries. Pop. (1900) 7,046.

Theresiopel. See SZABADKA.

Theresopolis, a summer health resort in the state of Rio de Janeiro, Brazil, 25 m. N.E. of city of Rio de Janeiro, 2,600 ft. above sea-level.

Therezina, cap. of Piahy, Brazil, on the Parnahyba, 200 m. from its mouth; it has a factory for cotton and thread, and an iron foundry. Pop. 22,000.

Theriaca are medicinal preparations of nauseous drugs, whose taste is masked by mixture with treacle or theriacum.

Therm, or British thermal unit of heat (B.Th.U.), is the amount of heat required to raise one pound of water 1° F.—from 60° F. to 61° F. It equals 251.9 calories.

Thermæ, public baths, containing both hot and cold baths, the finest examples of which were at Rome. These establishments consisted of a number of chambers, some of which were heated by fires burning in a hypocaust below. They were probably visited in the following order:—(1) the *apodyterium*, or dressing-room; (2) the *tepidarium*, or room heated to a moderately hot temperature; (3) the *caldarium*, or hot chamber, containing at one end a vapour bath, and at the other a hot-water bath; (4) the *frigidarium*, or cold bath, taken last to close the pores of the skin as a precaution against cold. Anointing and scraping the skin with a strigil followed. The thermæ at Rome, such as those built in Augustus's reign by Agrippa, and others by Nero, Titus, Trajan, Caracalla, and Diocletian, also contained lecture-rooms, porticoes, libraries, and other luxurious appurtenances. At these baths no fee was charged; at others it was the smallest current coin. The remains of the baths of Caracalla and Diocletian, and of the smaller baths at Pompeii, illustrate the subject clearly.

Thermal or Heat Capacity is the quantity of heat, measured in calories, British thermal units, or Joules, that is required to raise the temperature of unit mass of a substance one degree. The thermal capacity of particular bodies depends, of course, on their mass as well as their material, and is usually expressed as a 'water-equivalent'—i.e. as the quantity of water that has equal heat capacity. See SPECIFIC HEAT.

Thermal Unit. See THERM. CALORIE.

Thermidor, or the 'hot month,' the name given by the French revolutionary calendar to the 11th month; it extended from July 19 to August 18.

Thermit is a mixture of coarsely powdered aluminium and magnetic oxide of iron ('smithy scales,' Fe_3O_4), which when ignited, by setting on fire a pinch of a mixture of finely powdered aluminium and barium peroxide placed on it, reacts, producing iron and aluminium oxide at an intensely high temperature, approaching 3,000° C. This reaction has been utilized by Goldschmidt to weld masses of metal together *in situ*. Thus, if a crucible containing the reacting mixture is tapped over the joints of rails, the hot iron and slag partly melt the ends together, raising them also to welding heat, so that, if pressed together, a sound joint is made, dispensing with fish plates, and, in the case of rails for electric traction, with the electrical bonds as well. In a similar manner repairs can be made of crankshafts, stern-posts, rolls, pipes, etc., in which joints could otherwise not be made, or in places, such as on shipboard, where there are limited appliances. The heat of the reaction is also utilized for obtaining sound castings, portions of the mixture being introduced into the solidifying metal, and keeping it hot enough to flow freely. By substituting other oxides, such as those of chromium, manganese, or molybdenum, for the iron oxide, these metals in a massive condition, and free from carbon, silicon, and other impurities, can be obtained; whilst from mixtures of oxides valuable alloys are easily produced. The slag of aluminium oxide formed in these various applications is a most valuable ceramic material, as vessels made from a mixture of it and clay are exceedingly strong and elastic, and resist the action of acids and of heat to an extraordinary degree.

Thermo-chemistry is the science dealing with the heat changes that take place in chemical actions, such as when solutions are diluted, acids neutralized, or compounds formed or decomposed (the latter class including the important case of combustion). The quantities of heat evolved in these actions are measured by causing them to take place in a vessel immersed in a known quantity of water, when the product of rise of temperature of the latter into its mass (including the mass of water equivalent to the apparatus) gives the amount of heat developed. The vessel in which the action actually takes place varies widely

with the kind of action—for example, heats of combustion are best determined by burning a weighed quantity of the stuff in compressed oxygen contained in a steel bomb. Besides the direct methods of determination, the heat evolved in many actions can be calculated indirectly from the principle that the total quantity of heat produced or required in any action is independent of the number of stages in which the action has taken place. Thus, though carbon and hydrogen cannot be made to combine directly to form methane, the heat of formation of this compound can be determined by subtracting the heat evolved when the methane is burnt from that evolved when the corresponding weights of free carbon and hydrogen are burnt, the difference representing the heat given out in the formation of the methane. Besides its theoretical importance, the application of thermo-chemical methods to the determination of the heating power of solid, liquid, and gaseous fuels is of the utmost commercial value, as it is only by measuring this quantity that an accurate idea of the real worth of the fuel can be obtained. See Naumann's *Thermo-Chemie* (1882), Pattison Muir's *Elements of Thermal Chemistry* (1885); and, for a comparison of technical calorimeters, Brame and Cowen's and Gray and Robertson's papers in the *Journal of the Society of Chemical Industry*, xxii., xxiii.

Thermodynamics, the science which treats of the relations between heat and work. The experiments of Rumford and Davy at the end of the 18th century demonstrated a definite relationship between heat and mechanical energy. In 1843 Joule published his experimental determination of the mechanical equivalent of heat—i.e. the amount of mechanical energy which is equivalent to a given amount of heat. He found that 772 foot-pounds of work were required to raise the temperature of one pound of water one degree Fahrenheit. Subsequent experiments have shown 774 to be a more correct value. In 1824 Carnot published his *Réflexions sur la Puissance Motrice du Feu*, in which he discussed the possible percentage of heat that can be turned into work. Carnot here introduced the invaluable idea of a cycle of operations, in which the working substance, after having experienced a certain number of transformations, returns to its original state as to density, temperature, and physical condition. He also considered the special properties of a reversible cycle. In 1848 Lord Kelvin (then Sir W. Thomson) pointed out the value of Carnot's

researches, and by his investigations, together with those of Clausius and Rankine, developed the modern theory of thermodynamics.

Laws of Thermodynamics—First Law.—When mechanical energy is produced from heat, for each unit of work produced a definite quantity of heat is absorbed; and conversely, if heat be produced by the expenditure of mechanical energy, a definite quantity of heat is produced by the expenditure of a given amount of work.

Second Law.—It is impossible to convey heat from one body to another body at a higher temperature by the agency of a purely self-acting machine (Clausius). This law limits the possible thermal efficiency of any heat engine, the efficiency, which is given by the ratio

$$\frac{\text{heat turned into work}}{\text{heat taken in by the engine}}$$

being always very much less than unity even in a perfect engine. In all engines for transforming heat into work the transformation is effected by changes in volume of the working substance. In what follows we shall suppose the working substance to be of the nature of a fluid—i.e. the pressure to be uniform in all directions, and the same at all points of any given mass of the substance.

We can conveniently represent the changes taking place in the working substance by Watt's indicator diagram.

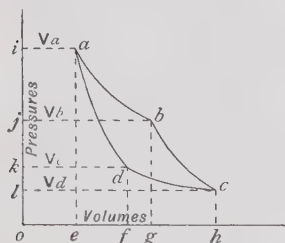


FIG. 1.

Then if the substance expand from *ai* to volume *cl* (Fig. 1), the work done by it is represented by the area *abche*; and if it be compressed from volume *cl* to volume *ai*, the work done upon it is represented by the area *adche*; and therefore the work done in a complete cycle is represented by the area *abcd*.

Carnot's Cycle.—Suppose we have a piston working without friction in a cylinder, the walls of which are perfectly non-conducting, but the bottom of which is a perfect conductor and provided with a non-conducting cover *C*. Suppose also that we have a

hot body *A* capable of supplying an unlimited amount of heat at a temperature T_1 , and a body *B* capable of absorbing any required amount of heat at a temperature T_2 , lower than T_1 . Let the cylinder contain a quantity of the working substance at temperature T_1 , and let the volume (v_a) be represented by *ai* (Fig. 1). The cycle is divided into four operations, as follows:—(1.) Apply the source of heat *A* to the bottom of the cylinder. The working substance will expand isothermally at temperature T_1 to a volume v_b , the piston rising and doing external work. This is represented on the indicator diagram by the expansion curve *ab*. (2.) Remove *A* and apply the cover *C*, allowing the working substance to do work on the piston in expanding to a volume v_c . The expansion will be adiabatic—i.e. without gain or loss of heat—and the temperature will fall. Suppose that at volume v_c the temperature is T_2 . (3.) Remove *C* and apply *B*, the piston at the same time being pressed down. The working substance will be compressed isothermally at temperature T_2 to a volume v_d , to be determined by the condition to be fulfilled in operation (4). (4.) Remove *B* and apply *C*, and let the compression be continued. The working substance will be compressed adiabatically, and its temperature will rise. Suppose that in operation (3) the point *d* has been so chosen that when the working substance is compressed to the original volume v_a the temperature has just risen to T_1 .

The heat in the above cycle of operations is supplied at a constant temperature T_1 , and rejected at a constant temperature T_2 ; also the working substance passes through a complete cycle, returning to its original condition as regards pressure, volume, and temperature. It is evident that each step in the above cycle might be gone through in the reverse direction. An engine in which this is possible is said to be 'reversible,' and Carnot showed that a reversible heat engine is a perfect heat engine, in the sense that no other heat engine working between the same limits of temperature can possibly have a higher efficiency. Suppose we have two heat engines *A* and *B* of equal powers, *B* being reversible; and let *A* drive *B* in the reverse direction. Let Q_A be the heat taken from the source by *A* per unit of work done, and Q_B the amount returned to the source by *B*. Let R_A be the heat returned to the cold body by *A*, and R_B the heat taken from the cold body by *B*. Suppose that *A* is more efficient than *B*. Then an amount of heat $Q_B - Q_A$ will be given to the hot

body and an amount $R_B - R_A$ taken from the cold body; and since *A* is more efficient than *B*, Q_A will be less than Q_B . Also, since the power is the same in each case, $Q_A - R_A = Q_B - R_B$ or $Q_B - Q_A = R_B - R_A$ —i.e. an amount of heat $R_B - R_A$ has been taken from a cold body and given to a hot body by means of a self-acting contrivance, which is contrary to the second law of thermodynamics. We conclude, therefore, that no engine *A* can be more efficient than a reversible engine *B* working between the same limits of temperature. If we now suppose *A* to be reversible, similar reasoning shows that *B* cannot be more efficient than *A*, and hence all reversible heat engines working between the same limits of temperature are equally efficient. As will be shown presently, the efficiency in the case of an engine working with a perfect gas is given by $\frac{T_1 - T_2}{T_1}$, where

T_1 and T_2 are the absolute temperatures at which heat is received and rejected respectively; and since all reversible engines are equally efficient, the above expression must be a measure of that efficiency. The above reasoning shows that reversibility (in the thermodynamic sense) is the condition for maximum efficiency in a heat engine, but that what may be called a perfect heat engine can only convert a fraction of the heat supplied into work, the fraction depending on the limits of temperature between which the engine works, but not at all on the nature of the working substance employed.

Thermodynamics of a Perfect Gas.—Gases which are extremely difficult to liquefy, such as air, follow very closely certain simple laws, and we speak of an ideal substance which follows these laws exactly as a perfect gas.

Laws of a Perfect Gas.—(1.) **Boyle's Law.**—The volume of a given mass of gas varies inversely as the pressure, provided the temperature be kept constant. If *P* be the pressure and *v* the volume of a given mass of gas, then $P \propto \frac{1}{v}$ or $Pv = \text{constant}$.

(2.) **Charles's Law.**—Under constant pressure all gases expand alike. Combining laws (1) and (2) we get $Pv = ct$, where *t* is the absolute temperature and *c* is a constant. If *P* be measured in pounds per square foot, *v* in cubic feet, and *t* in absolute Fahrenheit units, then *c* = 53.2.

(3.) **Regnault's Law.**—The specific heat at constant pressure is constant for any gas.

(4.) **Joule's Law.**—If a gas expand without doing external work, its temperature remains the same.

Relation between the Specific Heat at Constant Pressure (K_p) and the Specific Heat at Constant Volume (K_v).—Let one pound of gas at volume V_1 and temperature T_1 (absolute) be heated at constant pressure P till its volume and temperature are V_2 and T_2 respectively. Then the heat supplied will be—

$$K_p(T_2 - T_1) \dots (1),$$

and the external work done in expanding—

$$P(V_2 - V_1) = cT_2 - cT_1 = c(T_2 - T_1).$$

The difference between the heat supplied and the work done, *viz.*

$$(K_p - c)(T_2 - T_1) \dots (2),$$

is the change in the internal energy of the gas. Again, by Joule's law, if a gas expand without doing work, its temperature remains the same; and since it has neither gained nor lost heat, its internal energy must be unaltered. Since, therefore, the internal energy remains the same when the pressure and volume change, but the temperature remains constant, we conclude that the internal energy of a gas depends only on its temperature, and not upon its pressure and volume. If a mass of one pound of gas be heated from temperature T_1 to temperature T_2 , at constant volume, then, since no external work is done, the heat supplied must be expended in changing the internal energy of the gas, and therefore the change of internal energy between the temperatures T_1 and T_2 is

$$K_v(T_2 - T_1) \dots (3).$$

This must be equal to the other expression (2) for the internal energy; therefore,

$$K_v(T_2 - T_1) = (K_p - c)(T_2 - T_1) \\ K_v = K_p - c \dots (4).$$

The ratio $\frac{K_p}{K_v}$ is important, and is usually denoted by the letter γ , using which equation, (4) becomes

$$K_v = \frac{c}{\gamma - 1}.$$

Work done during Expansion.—In most of the cases which occur in practice of a fluid doing work in expanding, the expansion curve, as shown by an indicator diagram, can be represented more or less exactly by an equation of the form $PV^n = \text{constant}$, where n is a numerical index which is constant for any particular curve. The work done during expansion from (1) to (2), Fig. 2, is given by—

$$E = \int_{V_1}^{V_2} P dv = P_1 V_1^n \int_{V_1}^{V_2} \frac{dv}{v^n} \\ (\text{since } PV^n = P_1 V_1^n = P_2 V_2^n) \\ = P_1 V_1^n \left(\frac{V_2^{1-n} - V_1^{1-n}}{1-n} \right) \\ = \frac{P_1 V_1 - P_2 V_2}{n-1}.$$

If the fluid be compressed, the above expression gives the work required to be done on it.

Adiabatic Expansion.—If the expansion is adiabatic, then, since no heat is supplied, the internal energy must be reduced by an amount equal to the work expended; therefore, if T_1 and T_2 be the initial and final temperatures,

$$K_v(T_1 - T_2) = \frac{P_1 V_1 - P_2 V_2}{n-1} = \frac{c(T_1 - T_2)}{n-1}$$

$$K_v(n-1) = c = K_p - K_v.$$

$$\therefore n = \frac{K_p}{K_v} = \gamma.$$

For dry air $\gamma = 1.408$, so that for adiabatic expansion of air we have the expression

$$PV^{1.408} = \text{constant}.$$

Isothermal Expansion.—Since the temperature is to remain constant, the fluid must expand, ac-

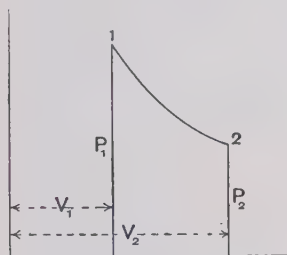


FIG. 2.

cording to Boyle's law—*i.e.* the expansion curve is given by the equation $PV = \text{constant}$. Then the work done in expanding from (1) to (2), Fig. 2, is given by

$$E = \int_{V_1}^{V_2} P dv = \\ P_1 V_1 \int_{V_1}^{V_2} \frac{dv}{v} = P_1 V_1 \log_e \frac{V_2}{V_1} \\ = P_1 V_1 \log_e r = P_2 V_2 \log_e r \\ = cT \log_e r,$$

where r is the ratio of expansion and T the absolute temperature of the expanding fluid. Since the temperature is constant, there is no change of internal energy, and therefore an amount of heat must be supplied equal to the work done—*i.e.* the heat supplied is equal to $cT \log_e r$. If the gas be compressed isothermally, it will reject an amount of heat given by the above expression, which is also equal to the work done on the fluid.

Efficiency of an Engine using Carnot's Cycle.—In Carnot's cycle the ratio of isothermal expansion is equal to the ratio of isothermal compression, and the ratio of adiabatic expansion is equal to the ratio of adiabatic compression; for, referring to Fig. 1, and call-

ing the pressure and volume at a , P_a and V_a , etc., we have—

$$P_a V_a = P_b V_b = cT_1, \quad P_b V_b \gamma = P_c V_c \gamma,$$

$$P_d V_d = P_c V_c = cT_2, \quad P_d V_d \gamma = P_a V_a \gamma.$$

$$\therefore \frac{T_1}{T_2} = \frac{P_a V_a}{P_d V_d} = \left(\frac{V_d}{V_a} \right)^{\gamma-1} = \left(\frac{V_c}{V_b} \right)^{\gamma-1}.$$

$$\therefore \frac{V_d}{V_a} = \frac{V_c}{V_b} \text{ or } \frac{V_c}{V_d} = \frac{V_b}{V_a} = r \text{ say.}$$

$$\text{Then efficiency} = \frac{\text{work done}}{\text{heat supplied}} \\ = \frac{\text{heat supplied} - \text{heat rejected}}{\text{heat supplied}} \\ = \frac{cT_1 \log_e r - cT_2 \log_e r}{cT_1 \log_e r} \\ = \frac{T_1 - T_2}{T_1}.$$

Entropy.—When a substance takes in or gives out heat it is said to change its entropy, the change of entropy ($d\phi$) being given by

$$d\phi = \frac{dQ}{T},$$

where dQ is the quantity of heat and T the absolute temperature at which it is taken in or given out. The total change of entropy from temperature T_0 to temperature T_1 is given by

$$\phi_1 - \phi_0 = \sum_{T_0}^{T_1} \frac{dQ}{T} = \int_{T_0}^{T_1} \frac{dQ}{T},$$

where ϕ_0 and ϕ_1 represent the entropy at temperatures T_0 and T_1 respectively. In calculating the entropy at any temperature, it is usual to find the rise of entropy of unit mass above some convenient point which is taken as the point of zero entropy. For example, in calculating the entropy of steam at any temperature, it is usual to take the entropy of water at 32°F . as zero.

Entropy of Steam.—The rise of entropy of one pound of steam at temperature T_1 above water at temperature T_0 is given by—

$$\phi = \int_{T_0}^{T_1} \frac{dT}{T} + \frac{x_1 L_1}{T_1} = \log_e \frac{T_1}{T_0} + \frac{x_1 L_1}{T_1}.$$

The first term represents the increase of entropy in heating the water from T_0 to T_1 , assuming the specific heat of water as unity, so that $dQ = dT$. The second term represents the rise of entropy during evaporation at constant temperature T_1 , evaporation being supposed incomplete, the fraction x being steam and the remainder water; if evaporation is complete, $x_1 = 1$, and the second term becomes $\frac{L_1}{T_1}$.

From the definition of entropy it follows that during adiabatic expansion the entropy will remain constant, since no heat is either received or rejected. Supposing one pound of steam and

water (x_1 being the dryness fraction) at temperature T_1 to expand adiabatically to any temperature T , we shall have from the last equation—

$$\log \frac{T}{T_0} + \frac{xL}{T} = \log \frac{T_1}{T_0} + \frac{x_1 L_1}{T_1},$$

$$\text{or } \frac{xL}{T} = \log \frac{T_1}{T} + \frac{x_1 L_1}{T_1}.$$

This result is known as the 'adiabatic equation' for steam.

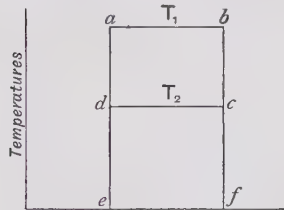


FIG. 3.

Entropy Temperature Diagrams (called also θ , ϕ diagrams, where θ represents the temperature).—By the definition of entropy

$$d\phi = \frac{dQ}{T},$$

$$\therefore dQ = Td\phi,$$

$$\text{or } \int dQ = Q = \int Td\phi;$$

that is, if we draw a diagram whose ordinates represent absolute temperatures and abscissa entropy, then the area of the diagram between any two ordinates measured down to the line of zero temperature (absolute) represents the heat received between those two points. Adiabatic expansion is represented by a vertical line, since, no heat being either taken or given out, the entropy remains constant. Isothermal expansion is represented by a horizontal line, since the temperature is constant. Fig. 3 represents the entropy tempera-

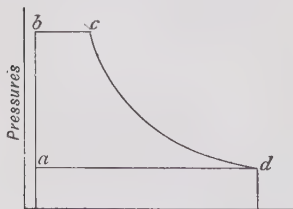


FIG. 4.

ture diagram for an engine using Carnot's cycle (see Fig. 1): ab is the line of isothermal expansion at temperature T_1 (absolute), and cd the line of isothermal compression at temperature T_2 ; bc and ad are the lines of adiabatic expansion and compression respectively. The area of the rectangle $abfe$ represents the heat

received during isothermal expansion, and the rectangle $dcef$ the heat rejected during isothermal compression. The difference, or the rectangle $abcd$, represents the heat turned into work. The efficiency is equal to

$$\frac{\text{heat turned into work}}{\text{heat received}} = \frac{\text{rect. } abcd}{\text{rect. } abfe} = \frac{T_1 - T_2}{T_1}.$$

Fig. 5 is the $\theta\phi$ diagram for an engine working on the 'Rankine cycle,' the corresponding indicator diagram being shown at Fig. 4, corresponding letters being used. The water is evaporated at constant temperature T_1 , expanded adiabatically down to the back pressure, condensed at constant temperature, and returned to the boiler. There is no compression. AB represents the rise in temperature of the feed from the temperature of the condenser (T_2) to that of the boiler; BC, evaporation at the temperature of the boiler (T_1); CD, adiabatic expansion; and DA, condensation at constant temperature T_2 . Increase of entropy of water from T_1 to T_2

$$= \int_{T_2}^{T_1} \frac{dT}{T} = \log_e \frac{T_1}{T_2}.$$

The curve AB is therefore a logarithmic curve. The efficiency is equal to

$$\frac{\text{heat turned into work}}{\text{heat supplied}} = \frac{\text{area } ABCD}{\text{area } ABCEG} = \frac{\text{area } ABCEG - \text{rect. } ADEG}{\text{area } ABCEG} = \frac{\text{heat supplied} - T(\phi_D - \phi_A)}{\text{heat supplied}},$$

where ϕ_D and ϕ_A are the entropies at D and A respectively, and

Therefore efficiency

$$= \frac{L_1 + T_1 - T_2(\phi_D - \phi_A)}{L_1 + T_1 - T_2} = \frac{L_1 + T_1 - T_2 - T_2 \left(\log_e \frac{T_1}{T_2} + \frac{L_1}{T_1} \right)}{L_1 + T_1 - T_2} = \frac{(T_1 - T_2) \left(1 + \frac{L_1}{T_1} \right) - T_2 \log_e \frac{T_1}{T_2}}{L_1 + T_1 - T_2}.$$

The Institution of Civil Engineers has adopted the efficiency working with the Rankine cycle as a standard to compare the results of actual engine trials with, the temperatures T_1 and T_2

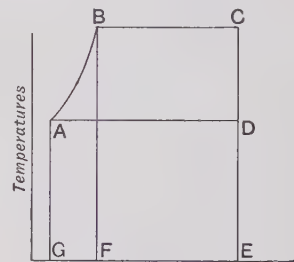
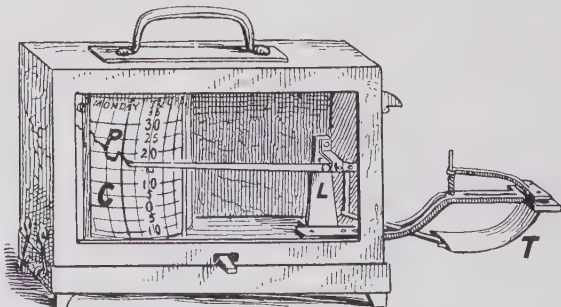


FIG. 5.

in the above expression for the efficiency being the temperatures of the steam on the boiler side of the stop valve and in the exhaust pipe respectively. The actual thermal efficiency is the ratio

$$\frac{\text{heat equivalent of work done}}{\text{heat supplied}},$$

and the ratio of the actual thermal efficiency to the thermal efficiency of a perfect engine, working on the Rankine cycle, between the same temperatures, is called the 'efficiency ratio.'



Thermograph—Richard Pattern.

t, Thermometer tube; z, levers working pen; p, pen making record; c, cylinder on which record is made

$(\phi_D - \phi_A)$ therefore the total increase in entropy in raising the water from the temperature of the feed (T_2) and evaporating it at temperature T_1 , since the entropy at D is the same as at A.

See Rankine's *Steam Engine* (ed. 1897); Cotterill's *The Steam Engine* (3rd ed. 1896); Tait's *Sketch of Thermodynamics* (2nd ed. 1877); Peabody's *The Thermodynamics of the Steam Engine*

(1889); and the papers of Lord Kelvin (Sir W. Thomson), in *Trans. of the Roy. Soc. Edin.*, or in his *Collected Papers* (1882).

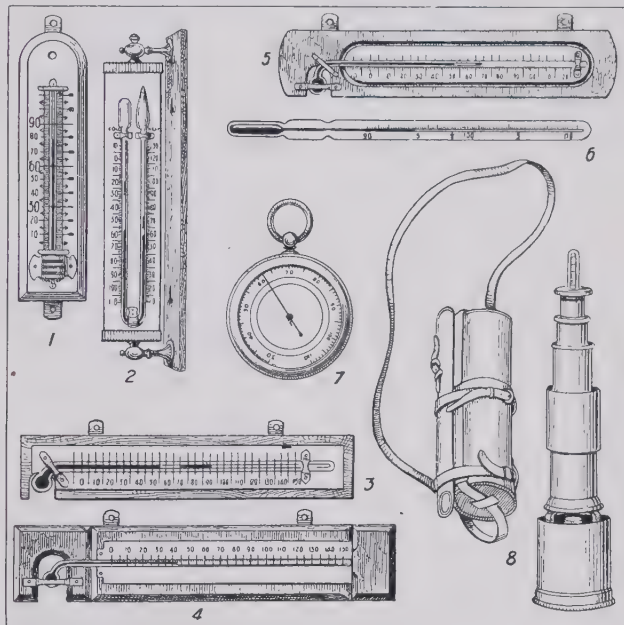
Thermo-electricity. See ELECTRICITY.

Thermograph, or automatically recording thermometer, an instrument for recording the fluctuations in the temperature of the air. The form in most general use is the Richard pattern (see Fig.). The thermometer in this instrument consists of a curved tube of metal filled with a non-freezing liquid. With a rise of temperature the expansion of the internal liquid straightens the tube; whilst, if the temperature falls, the curvature of the tube increases. The motion is magnified by levers, and is transmitted to a pen which makes a trace on a revolving drum driven by clockwork. Self-recording platinum resistance thermometers are also used for producing similar records.

Thermometer, an instrument for determining temperature, invented by Galileo towards the end of 1592. Fixed points for graduation appear to have been first employed by Sanctorio, a contemporary of Galileo, who used snow and the heat of a candle, dividing the range thus obtained into degrees. The first sealed thermometer was made by Ferdinand II., Grand Duke of Tuscany, about 1654. He filled the bulb and part of the tube with alcohol, and then melted the glass tip, thereby sealing the tube. In England, Boyle, at the request of the Royal Society, made experiments on thermometers about 1664, his *Lectures on Cold* being published in 1665. Mercurial thermometers appear to have been first employed in 1657 by the Accademia del Cimento of Florence. Renaldini, in 1694, suggested the use of the boiling-point of water as the upper limit of the scale. Great improvements in the thermometer were carried out by Fahrenheit from 1706. In 1714 he constructed the thermometer which bears his name, using three fixed points for the division of the scale. He arrived at his zero by taking a mixture of ice-water and sal ammoniac; the second point he obtained by mixing water and ice—this point he called 32°, or freezing-point. His third mark, or blood heat, was obtained by placing the thermometer in the mouth or in the armpit of a healthy man, and holding it there until it acquired the temperature of the body. He then divided the distance between the melting-point of ice—32°—and the boiling-point of water—212°—into 180°, or half the number of degrees in a

circle. This scale is in common use throughout the British dominions and in the United States. Many other scales were invented subsequent to Fahrenheit's time, but only two survive—viz. the scales of Réaumur and Celsius (centigrade). Celsius proposed to call the boiling-point of water 0° and its freezing-point 100°. In the instrument as now used the boiling-point is 100°, and the freezing-point 0°. This thermometric scale is largely employed on the continent of Europe, and is extensively used by scientific men of all nations. Réaumur, a French physicist, invented a third thermometer scale about 1731, in

alcohol; these fluids, contracting or expanding with changes of temperature, thus indicate degrees of heat in relation to two fixed points—viz. the freezing and boiling points of water (Fig. 1). Four steps are involved in the construction of a thermometer—(1) calibrating the tube, (2) filling, (3) curing, (4) graduating. Uniformity of calibre is ascertained by introducing a small quantity of mercury about an inch in length, and noting whether this thread of the liquid metal occupies the same space throughout the length of the tube. The filling of the thermometer is effected, after blow-



Thermometers.

(For explanation, see text.)

which there are only 80° between zero, the melting-point of ice, and the boiling-point of water. His choice was the result of experiments on the expansion of alcohol, he having found that alcohol diluted with one-fifth water expanded in volume from 1,000 to 1,080 when raised from freezing-point to boiling-point. Except in Russia and a few parts of Germany, the Réaumur scale is rarely employed. (See *Evolution of the Thermometer*, by Henry C. Bolton, 1900.)

A thermometer consists of a capillary glass tube of uniform calibre, sealed at one end and blown into a bulb at the other, which is filled with mercury or

ing a bulb at the bottom, by filling a small funnel at the top with mercury, and then partially expelling the air from the bulb by the application of heat. A vacuum is formed as the bulb cools, which is filled up by some of the mercury sliding back from the funnel into the bulb. This operation is performed several times, until the bulb is completely filled with mercury. The elimination of air from the upper portion of the tube is thus ensured. The instrument is then laid aside for a year or more, that the glass may assume a permanent form, and so obviate the error designated the 'displacement of zero.' The ther-

mometer is then graduated, the fixed points of melting ice and boiling water at a pressure of 29.905 inches being directly ascertained by experiment in every case. All thermometers intended for scientific purposes are verified at some central establishment, such as Kew Observatory, near London, and a certificate of accuracy given, for which a small charge is made. Self-registering instruments are so constructed as to mark the highest or the lowest temperature to which they have been exposed.

The oldest form of registering thermometer, if we exclude the unreliable instrument invented by Lord Charles Cavendish in 1757 (see *Philosophical Transactions*, vol. i. p. 300), is Six's, invented in 1781 (Fig. 2). It combines in one instrument the registration of the maximum and minimum temperatures. It consists of a long tube, which is bent parallel to itself, with a bulb blown at each end. The two bulbs and a portion of each tube are filled with spirit, but a plug of mercury occupies the space enclosed by the bend of the instrument. One bulb is larger than the other, and a bubble of highly compressed air is introduced into the smaller bulb. A small index, consisting of a steel needle sealed in a glass tube and kept in position by a hair, floats on each end of the plug of mercury. When the temperature rises, the spirit in the large bulb expands, and pushes the mercurial plug and index before it, the latter remaining at the highest point reached. When the temperature falls, the spirit contracts, and the plug is driven back by the pressure of the air bubble in the smaller bulb, thereby moving the minimum index as soon as the temperature is lower than the point at which the instrument was set. A magnet is used to set the indexes, which are drawn back by attraction to the extremities of the plug of mercury. This instrument is very liable to get out of order.

Of maximum thermometers the two forms most in use are Philip's and Negretti's. In the former instrument (Fig. 3) a small portion of the column of mercury is separated from the main thread by a minute bubble of air. When the temperature rises, the column expands, showing the separated portion in front of it; but when the column contracts, the index remains at the highest point, so marking the maximum temperature (Fig. 4). In the latter instrument the registration is effected by the mercurial thread itself, by constructing the bore of the tube in such a manner that, while the expansion of the mercury in the

bulb is sufficient to force the liquid past the obstruction in the tube, the cohesion of the metal is unable to draw back the portion in the tube when contraction takes place. The length of the thread of mercury remaining in the tube thus measures the highest temperature. Of thermometers for the registration of minimum temperatures there are two classes, according as the instrument is filled with mercury or spirit. Owing to the care required in the manipulation of the mercurial form it is seldom employed. Rutherford's spirit thermometer (Fig. 5) is the pattern in almost general use. This instrument is 'set' by allowing a small metallic index immersed in the spirit to run down to the end of the column of liquid. If the temperature rises, the spirit will flow freely past the index without moving it; but if the temperature falls below the point at which the instrument was set, the index by the force of capillary attraction is drawn back with it, and remains stationary at the lowest point reached by the fluid. Clinical thermometers (Fig. 6), for registering the temperature of the human body, are very small and delicate instruments made on this principle. Immisch's pocket metallic thermometer (Fig. 7) is a very delicate and sensitive instrument, in the shape of a watch.

The height of mountains may be determined by the temperature at which water boils, as this depends on the air pressure at the time. The lower the pressure the more readily does vapour liberate itself from the liquid, and ebullition accordingly takes place at a lower temperature as we ascend. A portable form of boiling-point thermometer or hypsometer is shown in Fig. 8, which is frequently employed by Alpine travellers and others for the determination of atmospheric pressure.

A gas thermometer is an apparatus for measuring the increase of pressure of a gas with rise of temperature at constant volume, or for measuring increase of volume with rise of temperature at constant pressure. These are described as constant-volume and constant-pressure instruments respectively. The figure shows diagrammatically the principle of the best form, that in use in the International Bureau of Weights and Measures at Paris. The parts are—(1) a, the bulb in a bath surrounded by mercury thermometers which are to be compared with it (since the apparatus is so large, and a determination of temperature so tedious, that it is only used as a standard); (2) a tube, I; and (3)

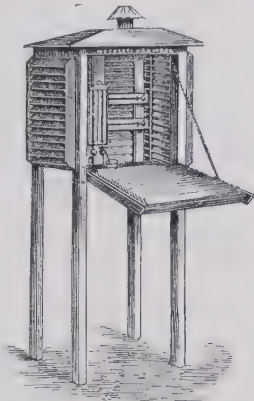
a movable reservoir, L. There is vacuum above I; so the difference in the levels I, J, of the mercury surfaces is the pressure on the gas. When the temperature of the bath is altered, the reservoir may be manipulated so as to reproduce either the same level, J (constant-volume), or the same difference of levels (constant-pressure). In these cases the pressures or the volumes are taken as proportional to temperatures. Either mode of procedure, and any one of the 'permanent' gases, will lead to practically the same results, and this is the requirement of an absolute scale. Since for each degree C. decrease of temperature the volume of pressure obtained by these means decreases by about $\frac{1}{273}$ of the pressure or volume at the freezing-point, it leads to the idea that if the law should continue to hold to 273° C. below freezing-point, a gas would either exert no pressure or have no volume at this temperature; and there could be no lower temperature than this. We thus arrive at the idea of an absolute zero of temperature, and temperatures measured from this point are called 'absolute temperatures.' Absolute centigrade temperatures are thus represented by numbers 273 greater than the numbers in the ordinary centigrade system. In the Bureau instrument the bulb is of platinum-iridium, and contains about a litre of hydrogen maintained at constant volume. Though the gas scale described and its zero agree closely with the absolute scale and zero (those of the absolute thermodynamic scale of Kelvin), they are not identical. The original definition of absolute temperature will be found under THERMODYNAMICS. The zero given by the hydrogen thermometer is -273.13° C., and by the air thermometer -272.44°; but if these be corrected by using the results of a certain 'porous plug experiment' of Joule and Kelvin, the absolute zero is found to be between -273.0° and -273.1° C. This low temperature never will be reached, but already a temperature less than 20° above it has been obtained by boiling liquid hydrogen under reduced pressure. See GASES AND VAPOURS.

For great accuracy combined with considerable convenience nothing approaches the platinum thermometer invented by Sir W. Siemens, and lately brought to great perfection by Professor Callendar. In this method temperature is determined by an observation of the resistance of a platinum wire. The employment of this principle possesses an approach to an absolute scale, in respect that the rate of increase

of resistance of all pure metals, with two or three exceptions, is the same. Further, the coefficient of increase is about the same as the coefficient of expansion for the permanent gases—roughly $\frac{1}{273}$ —and consequently the absolute zero of temperature obtained by assuming this simple coefficient is also about -273°C. , at which temperature the resistance of the metal should be zero if the coefficient were a constant. If this simple law were assumed, then by measuring the resistance at the freezing-point and the boiling-point of water, the temperature corresponding to any other resistance could at once be calculated by simple proportion. These temperatures would, however, differ slightly from those obtained from an air thermometer, and so they are distinguished as platinum temperatures. For reduction to gas (or absolute) temperatures a small correction must be applied, following a simple law. The amount of this correction being ascertained for one temperature, it can be calculated from the law for any other. The temperature recommended by Callendar is that of boiling sulphur, which is known to be 444.53°C. on a gas thermometer. No great error will be produced, however, by assuming that the resistance of the wire would be zero at -273°C. The improvements of Callendar and Griffiths consist in the selection of the materials and the mode of winding the wire so that it may not become strained in the process of heating. It is wound loosely on a strip of mica with serrated edges, and connected to stout copper wires, and the whole is enclosed in a strong wrought-iron tube. Changes in the resistance of the leads can be eliminated by having an exactly similar pair alongside, but without the platinum part of the circuit. The resistance of the latter pair is measured and subtracted from the total. A measurement of resistance is now a comparatively light and accurate operation, a form of Wheatstone-bridge method being used. (See ELECTRIC TESTING.) With pure platinum the readings need not lead to an error of more than 0.1°C. up to 200°C. , and an error of 1°C. is almost unavoidable in the use of a mercury thermometer at this temperature. Further, its range is very great, extending from the lowest attainable temperatures at which alcohol would be quite viscous to $1,300^{\circ}\text{C.}$, at which most solids either soften or become porous to gases, and even at this temperature the error need not exceed 1°C. ; consequently it is an admirable pyrom-

eter. See also PYROMETER and RADIOMETER.

Thermometer Screen. Thermometers for registering the shade temperature require to be exposed in a screen specially constructed so as to protect them from the direct rays of the sun, but at the same time to allow air to circulate freely around them. These ends are best met by exposing them in a box designed by Mr. Thomas Stevenson of Edinburgh. The 'Stevenson screen' is double-louvred, its interior dimensions being 18 in. long, 11 in. wide, and 15 in. high. Its roof is double, the upper one projecting two inches beyond the body of the screen. A hinged door facing north opens downwards. The thermometers are placed as nearly as possible with the bulbs at a height of four feet above short grass, and not less than seven feet from any wall which might affect the results, by the radiation of heat in hot weather. The screen is painted white inside and out.



Stevenson Thermometer Screen.

Thermopylæ, a pass in N. Greece, the only approach from Thessaly into Locris. The name ('the Hot Gates,') is derived from some hot springs which rose at its eastern end. The difficulty of the pass was due to the narrowness of the way between Mount Œta and the morass formed by the springs, only room for a single carriage being left. Since then the nature of the ground has been entirely changed. The most famous battle at the pass was that fought in 480 B.C., by Leonidas and the Greeks against the host of Xerxes, king of Persia. The round hill on which he and his 300 Spartans made their last stand can still be identified at the western entrance to the pass. Again, in 279 B.C., 24,000 Greeks held the pass for months against Brennus and 170,000 Gauls. Like

the Persians, the Gauls at last came round by the hills; but the Greeks escaped by sea. A third battle was fought there in 191 B.C., when the Romans, Acilius Glabrio and Porcius Cato, forced the pass against the army of Antiochus III., king of Syria.

Theron, tyrant of Agragras (Agrigentum) in Sicily. After seizing supreme power about 490 B.C., he ruled well until his death, in 472. Under him Agragras was the second city in Sicily. His expulsion of Terillus, tyrant of Himera, who sought help from Carthage, led to the great Carthaginian invasion, defeated by Gelon and himself at Himera in 480 B.C. He founded the five temples the ruins of which still exist at Girgenti, the modern name of Agragras.

Thersites, one of the Greeks who fought against Troy. He was a man of the people, represented by Homer as delighting to strive with the nobles; he is, in fact, the first mob orator described in literature. Homer adds that he was the ugliest man in the army—hunch-backed, lame, and woolly haired. He attacked Agamemnon in a bitter speech, and was soundly thrashed by Odysseus for it (*Iliad*, bk. ii.). According to later poets, he was killed by Achilles. He is introduced by Lucian in some of his works, and also appears in Shakespeare's *Troilus and Cressida*.

Thesaurus. See DICTIONARY.

Theseus, in ancient Greek legend the great hero of Athens and Attica, was brought up at Trœzen, and whilst on his way to Athens he killed the robbers Periphetes, Sinis, Sciron, Cercyon, and Procrustes. After his arrival and the recognition of him by his father Ægeus, king of Athens, he slew the bull of Marathon, and then voluntarily went to Crete as one of the seven youths who, with seven maidens, were annually sent as tribute to Minos, to be devoured by the Minotaur. Theseus succeeded in slaying the monster, thanks to Minos's daughter Ariadne, who gave him a sword and a clue of thread, by which he made his way out of the labyrinth. He then took her away with him, but left her in Naxos. On approaching Athens he forgot to change the ship's black sails for white ones, as he had promised his father to do if he succeeded; and Ægeus, seeing the ship afar off from the Acropolis rock, cast himself down, and was killed. Then Theseus became king. As such he led an expedition against the Amazons, and carried off their queen, Antiope or Hippolyta; in turn they invaded Attica, and were only defeated in the very

streets of Athens. By Antiope he had a son Hippolytus. After her death he married Phædra. Theseus was famous for his friendship for Pirithous, king of the Lapithæ, whom he aided in his battle against the Centaurs; with him he also carried off Helen, while a girl, from Sparta, and placed her in Aphidnæ with his mother Æthra. In turn he aided Pirithous in his attempt to carry off Persephone from Hades. Pirithous perished, and Theseus was chained in Hades until Hercules released him. Meanwhile, Castor and Pollux had carried off Helen and Æthra; and Menestheus had aroused the Athenians against Theseus, who, on returning to Athens, could not regain his royal power, so that he retired to Scyros, where he was murdered by Lycomedes. Theseus was said to have shared also in the Argonautic expedition and the hunt of the Calydonian boar, and to have compelled the Thebans to give burial to the seven who perished before their gates. He was also believed by the Athenians to have united all the townships in Attica into the one state of Athens—a union celebrated in the festival of the Synœcia. He was also held to have been the first founder of the constitution of Athens, ruling himself as a constitutional sovereign. It is hard to disbelieve in his historical existence, though it is evident that much legend has become mixed with his story; yet Bury holds that he was only a god of the district of Marathon. When, in 472 B.C., Cimon captured Scyros, a skeleton of huge size was found; and was brought to Athens as the veritable bones of the hero.

Thesiger, Frederick. See CHELMSFORD, LORD.

Thesmophoria, a festival in honour of Demeter, celebrated by women only, in various parts of Greece; it commemorated the institution of laws and civilization, which was attributed to Demeter. At Athens the festival was held about October. The women walked in procession from the city to Eleusis, and held two other days of festival there.

Thesmotheta. See ARCHON.

Thespiæ, a town in Boeotia in ancient Greece, on the S.E. slope of Mount Helicon, not far from the Corinthian Gulf. In 480 B.C. it and Plateæ were the only two Boeotian towns which refused to submit to Xerxes; 700 of its men fell with Leonidas at Thermopylæ. The town was destroyed by the Persians, but 1,800 of its citizens shared in the victory of Plateæ. In the 4th century B.C. it was destroyed by the Thebans (c. 370 B.C.) for favouring the Spartans.

Thespis, a native of Icaria in Attica, was the real founder of drama. Before his time choruses sang hymns in honour of Dionysus, relating his exploits. Thespis devised the idea of having an actor to play the part of Dionysus, and, by his dialogue with the leader of the chorus, to give dramatic vigour to the story. He is said to have also introduced the tragic masks, by wearing which one actor could support several characters. He performed at Athens before Solon's death (558 B.C.), and lived to see the drama established as a state institution by Pisistratus in 535.

Thessalonians, FIRST AND SECOND EPISTLES TO THE, two of the Pauline group of letters in the New Testament. According to the traditional view, they were written by the apostle while he was at Corinth, after his visit to Thessalonica on his first missionary journey, and the date generally assigned to them is 52-53 A.D. The first epistle expresses the gratitude of the apostle and his companions Silas and Timothy for the continued success of the gospel among the Thessalonians; and it gives directions for the furtherance of spiritual life, for the regulation of the church, and instructs them regarding the return of Christ. The second epistle, also written as from the three, is likewise largely hortatory; but its distinctive feature is the warning against the view that the 'day of the Lord' is to be immediate, and the assertion that a certain series of events—a restraint upon lawlessness, its removal, apostasy, and the appearance of the 'man of sin'—must first work itself out. The authenticity of the first epistle is guaranteed if the second be accepted; but the latter is, outside the pastoral epistles, the most disputed among the writings attributed to Paul, chiefly owing to the passage which relates to the delayed second advent being, as is supposed, out of harmony with the general eschatology of the epistles. The first doubts were raised by J. E. C. Schmidt (1801); De Wette acquiesced, then resiled; Baur, however, directed the critical artillery against both epistles. The trend of more recent investigation is, on the whole, in favour of the genuineness of the first; the judgment regarding the second still wavers, with good names on both sides—e.g. against Paul, Spitta and Schmiedel; for Paul, Jülicher, Zahn, Moffat (*Hist. N.T.*). See Findlay (*Camb. Bible*), Lightfoot, Schmiedel in *Hand-Com.*, Meyer (new ed. by Bornemann).

Thessalonica. See SALONICA.

Thessaly, one of the chief divisions of Greece, bounded on the E. by the Ægean Sea, and on

the W. by Mt. Pindus. For the most part it is a plain, surrounded by mountains except at the N.E., where the river Peneus flows out through the vale of Tempe; Outside the mountain barrier it included two other districts—Magnaesia on the Ægean coast, with Mts. Ossa and Olympus to the W.; and a long narrow vale between Mts. Othrys and Ceta, at the S. It was famous for breeding horses. Phthiotis was the original home of the Hellenic race proper, and the Achæans also first appear in Thessaly. In early Greek mythology it is famous in connection with the Argonauts. About 1200-1000 B.C. the Thessalians broke in from the north-west, expelled many of the previous inhabitants, and reduced the rest to serfs. In the 4th century B.C. Jason of Phæra made the Thessalians a great power for a short time; but in 344 they were conquered by Philip of Macedon, and thenceforward were subject, first to Macedon and afterwards to Rome.

Thetford, munic. bor., Norfolk, part in Suffolk, England, connected by bridge over the Thet, 7 m. E.S.E. of Brandon. It has been the seat of a suffragan bishopric since 1894. Pop. (1901) 4,613.

Thetis, in ancient Greek mythology, was a sea goddess, who wedded Peleus; though it is said that both Zeus and Poseidon wished to marry her, but gave up the idea on being warned by Themis that the son of Thetis would be more famous than his father. The wedding of Peleus and Thetis was attended by all the gods except Eris, who was not invited, and who therefore cast down before the gods the famous apple, inscribed 'To the fairest,' which led to the judgment of Paris and the Trojan war. Their son was Achilles, for whom Thetis won from Zeus the boon that the Trojans should prevail while he abstained from fighting in the war, and for whom she persuaded Hephestus to make armour.

Theuriet, ANDRÉ (1833), French novelist and poet. He was born at Marly le Roi, and entered the public service in 1857. During 1857-72 he produced several poems of considerable charm. In 1874 he made his first appearance as a novelist. *Mademoiselle Guignon* (1874), *Le Mariage de Gérard* (1889), *La Fortune d'Angèle* (1876), *Raymonde* (1887), *Le Filleul d'un Marquis* (1878), *Le Fils Maugars* (1879), *Tante Aurélie* (1884), *Flavie* (1895), *Refuge* (1898), *Claudette* (1900), *Le Manuscrit du Chanoine* (1902), followed one another rapidly. Theuriet became an Academician in 1896.

Thian-Shan. See TIAN-SHAN.
Thibaudin, JEAN (1822-1905), French general and statesman, was born at Moulins-Engilbert, Nièvre. He served during the Franco-German war (1870-1), and was taken prisoner at Metz. Escaping to France, he fought under an assumed name. In 1882 he was made general, and was appointed commandant of Paris in 1886. In 1888 he was retired.

Thibaut IV. (1201-53), count of Champagne, French poet. In the Albigensian war he accompanied Louis VIII., and later yielded up to Louis IX. his rights on Blois, Chartres, and Sancerre. On the death of his uncle, Sancho

Ueber Reinheit der Tonkunst (7th ed. 1893).

Thibet. See TIBET.

Thick-knee. See CURLEW.

Thielt, tn., cap. of prov. W. Flanders, Belgium, 20 m. s.w. of Ghent; has manufactures of lace, and of cotton, linen, and woollen goods. It has never recovered the importance it had prior to the destructive fire of 1883. Pop. (1900) 10,576.

Thierry, JACQUES NICOLAS AUGUSTIN (1795-1856), French historian, born at Blois. Secretary and 'adopted son' of Saint-Simon, he published, in collaboration with him, social and political works. Parting from his master in 1817, and joining Comte, he

(1835), and *Essai sur l'Histoire du Tiers Etat* (1853). In 1855-6 appeared his complete works in 10 vols. See Aubineau's monograph (2nd ed. 1879).

Thiers, a picturesque tn., dep. Puy-de-Dôme, France, 22 m. N.E. of Clermont, celebrated for cutlery. It has several ancient buildings, such as the church of Saint-Jean (15th century). Thiers is generally held to be the 'Ville Noire' of George Sand's novel. Pop. (1901) 17,478.

Thiers, LOUIS ADOLPHE (1797-1877), French historian and statesman, was a native of Marseilles. When twenty-three he went to Paris, and devoted himself to journalism and literature, and



Ancient Thessaly.

the Strong, in 1234, he became king of Navarre, and subsequently took part in a crusade to the Holy Land. He wrote admirable love songs and other lyrics (ed. by Tarbé, 1851). See *Life* in French by Delbarre.

Thibaut, ANTON FRIEDRICH JUSTUS (1772-1840), German jurist, born at Hameln; became professor of law in Kiel (1798), Jena (1802), and Heidelberg (1806). Besides his principal work, *System des Pandektenrechts* (9th ed. 1846), he published *Theorie der logischen Auslegung des röm. Rechts* (2nd ed. 1806), *Besitz und Verjährung, Zivilistische Abhandlungen* (1814). His judgment in music is attested by his

contributed to the *Censeur Européen* a series of historical articles. In 1820-1 appeared his *Lettres sur l'Histoire de France*. In 1825 his *L'Histoire de la Conquête d'Angleterre par les Normands* (4 vols., Eng. trans.), characterized by original research, versatility, width of view, and picturesque description, was recognized as a new departure in historical treatment. Blind from 1826, and from 1830 a member of the Academy of Inscriptions, he lived with his brother at Vesoul for four years. He published, in 1840, *Récits des Temps Mérovingiens*, for which he was awarded the Academy's Gobert prize. Other works were *Dix Ans d'Etudes Historiques*

soon became something of a figure on the opposition side. An admirer made him wealthy by giving him a share in the *Constitutionnel*, the journal for which he wrote most; and he established his fame by publishing in 1823 the first two volumes of his *Histoire de la Révolution Française*, a work which has not stood the test of historical criticism. It was a journal, the *National*, started by Thiers and his friends, that provoked the Ordonnances of July 1830, which brought about the fall of Charles X. and the advent of Louis Philippe. Aix now sent him to the Chamber of Deputies, and he passed through various cabinet offices

on the way to the premiership, which he attained in 1836; only, however, to go into opposition almost immediately, having quarrelled with the king over the Spanish question. Four years later he was recalled to the premiership, and being now his own foreign minister, was able to put the copstone on his previous efforts to embroil France with Great Britain. He supported Mehemet Ali, with a view to securing Syria and Egypt for France, and in general did his utmost to revive Napoleonic aggressiveness. When he did force an inchoate rupture with Britain over the seizure of the Society Is., his success was fatal to himself, and he had again to retire into opposition. He made a feeble attempt to obstruct the ambition of Louis Napoleon in 1843, only to be banished in 1851; and when he was permitted to



Louis Adolphe Thiers.

return in the following year, it was to give literature another turn of his attention. His best-known work, *L'Histoire du Consulat et de l'Empire*, came out between 1845 and 1862, and he did not re-enter the Chamber till 1863. He was the most eloquent critic of Napoleon's foreign policy—he published in 1867 *Discours Prononcés au Corps Législatif*—and opposed the war of 1870. He made an abortive diplomatic mission after Sedan to procure the intervention of the great powers, but he secured the armistice which enabled a National Assembly to be elected. He was placed first at the head of the provisional government, and then in August 1871 elected president of the republic. It was mainly due to his exertions that France was soon freed from the presence of the Germans, and that the indemnity was rapidly

paid up; and it fell to him to suppress the commune. He was unable, however, to withstand the intrigues of the radicals and reactionaries for more than two years, and demitted the presidency. But he helped to overthrow Broglie. Thiers was the greatest of the journalist statesmen France has produced, though only a great man of the second class; but his conduct after the war is mainly above criticism. See J. Simon's *Le Gouvernement de Monsieur Thiers* (1878); *Thiers*, Guizot, Rémusat (1885); Mazade's *Monsieur Thiers* (1884); Rémusat's *Adolphe Thiers* (1892).

Thigh, the thick fleshy portion of the leg between the trunk and the knee. It contains the largest bone in the skeleton, the femur, which articulates with the os innominatum above, with the tibia below, and with the patella anteriorly. The femoral artery traverses the thigh, beginning between the spine of the ilium and the pubic symphysis, and passing downwards and inwards to end in the popliteal space behind the knee. Around the powerful muscles of the thigh is a strong fibrous sheath, which invests the limb like a sleeve.

Thingvalla-vatn, the finest of the Iceland lakes, having an area of about 30 sq. m., lies 24 m. E. of Reikjavik. At its upper end is Thingvellir, the site of the ancient Althing, or popular assembly.

Thio-derivatives are compounds, such as potassium thiocyanate, KCNS, in which sulphur has replaced an equivalent amount of oxygen, in this case in potassium cyanate, KONO.

Thionville. See DIEDENHOFEN.

Thiophene, C_4H_4S , is a compound of 'ring' structure occurring in coal tar, from the crude benzene of which it can be extracted by shaking with concentrated sulphuric acid. Thiophene is a colourless volatile liquid (b.p. $84^\circ C.$, sp. gr. 1.06), very closely resembling benzene. It may be recognized by giving a blue colour with isatin and sulphuric acid, and is the parent substance of a number of derivatives.

Third, in music. See INTERVAL.

Thirlage, a servitude, once very common in Scotland, under which the possessors of certain lands were 'thirled,' thrallied, or astriated to carry the grain produced on those lands to a certain mill, and to pay, by way of 'multure' and towards the expense of erection and maintenance of the mill, a certain proportion of the grain ground.

Thirlmere, or LEATHES WATER, lake, Cumberland, England, N.W. of Helvellyn, the chief

source of the Manchester water supply. A dam, 800 ft. long, constructed in 1890-94, closes the valley, and aqueducts convey the water 95 m. to Manchester.

Thirlwall, CONNOP (1797-1875), English bishop and historian, was born at London. From 1827 he was lecturer and tutor at Cambridge. In 1834 he became rector of Kirby Underdale, where he wrote his *History of Greece* (1835-44), and six years later was appointed bishop of St. David's. This see he held until a year before his death. Thirlwall made many translations from German authors. His essays and sermons were edited by Perowne as *Remains, Literary and Theological* (3 vols. 1877-80). See also his *Letters* (1881), with memoir, edited by Stokes; and *Letters to a Friend* (1881), edited by Stanley.

Thirsk, tn., N. Riding, Yorkshire, England, 8 m. S.E. of Northallerton. Pop. (1901) 3,093.

Thirst is the sensation of uneasiness caused by want of fluid. The sensation is one of heat and dryness, and may be confined to the tongue, mouth, and fauces. Such a local thirst is allayed by water, or by substances which excite the flow of saliva. Frequently, however, thirst is the expression of a general condition indicating either lack of fluid or excess of saline substances in the tissues. In some diseases—diabetes, for example—this sensation is intensified, and there seems to be a thirst centre in the brain. Small quantities of slightly bitter and acid drinks slake thirst most effectively, and chips of ice added to such are grateful to fever patients. Rinsing out the mouth with water as hot as can be borne is also useful, while in the non-febrile thirst of diabetes tepid drinks are often most effectual.

Thirty-nine Articles, THE, or 'Articles agreed upon by the archbishops and bishops of both provinces, and the whole clergy, in the Convocation holden at London in the year 1562,' were drawn up 'for the establishing of consent touching true religion.' Together with the Book of Common Prayer, they form the basis of doctrine and practice upon which the clergy of the Church of England are required to act. They were preceded in 1552 by forty-two articles, which were in 1562 revised and reduced to thirty-nine. Their history is as follows. In 1551 Archbishop Cranmer was directed by the Privy Council to 'frame a book of Articles of Religion.' He prepared forty-two, which were issued in 1552. They were, however, abrogated by Queen Mary. The first Parliament of Elizabeth (1559) restored the English liturgy, and in 1571 the re-

vised articles of 1562 were ratified by Convocation, and issued by the queen's command. The articles were printed in both Latin and English, both versions being of equal authority. They are divisible into six parts:—(1.) Arts. i.-v. The nature and attributes of God; the Deity, incarnation, and passion of Christ; His death, descent into hell, resurrection, ascension; the judgment; the Deity and Personality of the Holy Ghost. (2.) Arts. vi.-viii. The authority of Scripture; the canonical books; the reception of the three creeds. (3.) Arts. ix.-xviii. The way of salvation; the existence of original sin as an 'infection of nature'; the impotency of the human will to effect salvation; the doctrine of justification through Christ; the place of good works in the life of a Christian; the difference between good deeds which are done without faith from those which are done 'as God hath willed and commanded them'; the impossibility of there being any 'works of supererogation'; the sinfulness of all men, and the case of sins committed after baptism; the doctrine of predestination, and of salvation 'only by the name of Christ.' (4.) Arts. xix.-xxiv. The definition of the church. The church is that 'in which the pure word of God is preached, and the sacraments be duly administered.' This church has power and authority to enact anything not 'contrary to God's Word.' General councils must be summoned by the 'will of princes.' They may err, and have erred. Certain Romish doctrines are repudiated. The ministry is defined, and the two sacraments, with other authorized rites of the church. The unfitness of ministers is not to render sacraments invalid. The cup is not to be denied to the laity. The sacrifice of Christ must not be understood to be repeated in the eucharist. Priests may marry. Penance must be submitted to when deserved. (5.) Arts. xxv.-xxxvii. Regulations as to preaching and orders. The jurisdiction of the pope in England is repudiated. (6.) Arts. xxxviii., xxxix. On some civil rights and duties. See Browne's *Exposition of the Thirty-nine Articles* (new ed. 1887).

Thirty Years' War, THE (1618-48), was due partly to religious, partly to political causes. The years from 1618 to 1633 form the religious period of the war, during which Bohemia and the Lower Palatinate fell into the hands of the emperor. The offer of the Bohemian crown to Frederick, count palatine, and son-in-law of James I., led to the invasion of Bohemia by the im-

perial troops, and to the defeat of Frederick in the battle of the White Hill (1620). His own dominions in the Lower Palatinate were then invaded, and, owing to James I.'s irresolution and belief in words, were seized by Ferdinand, who gave them to Maximilian of Bavaria, the head of the Catholic League. The war, which so far was ostensibly concerned with the Bohemian and Palatinate questions, then developed into an attempt of the Hapsburgs to form a great Austrian empire, with the Baltic seaports under their control. The Lutheran princes were quietened with assurances, while one army under Tilly and another under Wallenstein swept over N. Germany. In 1625 Christian IV., king of Denmark, alarmed at the progress of the imperial forces, came to the rescue of German Protestantism. But he was defeated at Lutter in 1626, and made the peace of Lübeck in 1629. Meanwhile Wallenstein had almost succeeded in establishing the Hapsburg supremacy over the north of Germany, as well as over the Baltic. He failed, however, in 1628 to take Stralsund. In July 1630 Gustavus Adolphus came to the aid of the German Protestants; and two months later the Diet of Ratisbon, jealous of his power, forced the emperor to dismiss Wallenstein. Deprived thus of the services of his great general, Ferdinand was unable to resist Gustavus Adolphus, who, in September 1631, defeated Tilly at Breitenfeld, and marched into S. Germany. After winning a battle on the Lech (1631), where Tilly was mortally wounded, he was opposed by Wallenstein, who had been restored to favour. On Nov. 16, 1632, Gustavus won the battle of Lützen, but was himself killed. From 1633 to 1648 the war assumed a political aspect, and resolved itself into a struggle between France, aided by Sweden, and the Hapsburgs of Austria and Spain. Though in 1634 Ferdinand won a victory at Nördlingen over the Swedes, and by the peace of Prague detached several Lutheran princes from the anti-Hapsburg cause, the intervention of France proved irresistible. Richelieu allied with the Dutch, the Catalans, and several Italian princes, and the Hapsburgs were hard pressed. Mazarin continued Richelieu's policy, and Turenne and Enghien won several brilliant victories over the imperialists. The great rebellion kept England neutral, and in 1648 the Emperor Ferdinand III. suffered a series of disasters. His ally, the elector of Bavaria, was overthrown at Zusmarshausen. Little Prague was taken by the Swedes, and Condé (late Enghien) won the

battle of Lens. Ferdinand then agreed to the peace of Westphalia (October 1648). France and Sweden secured important territorial acquisitions, the German princes obtained independence, and the power of the emperor was only supreme in the Austrian dominions. The attempt of the Austro-Spanish house to restore Roman Catholicism all over Central Europe had failed, and the hopes at one time entertained at Vienna of converting Germany into a consolidated Hapsburg state were shattered. See Gardiner's *Thirty Years' War* (1847), Ward's *The House of Austria* (1869) and *The Counter-Reformation* (1889), Gindely's *The Thirty Years' War* (Eng. trans. 1885), Winter's *Der Dreissigjährige Krieg* (1893), and Schiller's *History of the Thirty Years' War*.

Thistle. See PYRAMUS.

Thisted, tn., N.W. Jutland, Denmark, on Thisted Broad. Shipbuilding and cotton-spinning are the chief industries. In 1696 the whole female population believed itself to be bewitched. Pop. (1901) 6,072.

Thistle, a popular name given to plants belonging to the genera *Carduus*, *Cnicus*, *Silybum*, *Echinocactus*, *Sonchus*, *Echinops*, and *Onopordum*. Among the common British thistles are the carline thistle, which occurs chiefly on heathy land; the musk thistle (*Carduus nutans*), a handsome plant; the wetted thistle (*Carduus acanthoides*); the Scotch thistle, (*Onopordum acanthium*); and the spear plum thistle (*Cnicus lanceolatus*). The thistle is the national emblem of Scotland.

Thistle, ORDER OF THE. See ORDERS OF KNIGHTHOOD.

Thistleton-Dyer, SIR WILLIAM TURNER. See DYER.

Thistlewood Conspiracy. See CATO STREET CONSPIRACY.

Thlinkits, North American aborigines, whose territory lies on the Pacific seaboard between the Atna R. and the Queen Charlotte Archipelago. There are several distinct groups, such as the Sitkas, Stalkins, Chilcats, and the inland Tagishes, all speaking dialects of the same stock language, which is noted for its extremely harsh phonetic system. This is partly due to a large dishlike lip ornament which is worn by all. In their physical and mental characters the Thlinkits show affinities both with the northern Eskimo, or Aleuts, and with the southern Columbians, thus forming the connecting link between these two races. They number collectively about 6,500.

Tholen, isl. (47 sq. m. in area), prov. Zealand, Holland, and tn. on its E. coast.

Tholuck, Friedrich August Gottlieb (1799-1877), German theologian and preacher, was born at Breslau, studied at Berlin under Neander's influence; succeeded De Wette (1824) in the chair of Oriental languages there, and in 1826 was called as professor of theology to Halle, where he died. Of his numerous works,

ihre Weissagungen (1860); *Stunden christlicher Andacht* (1870); *Die Gebetslehren* (1872). See collected works (11 vols. 1862-73); studies, by Kähler (1877) and Witte (1886).

Thom, William (1798?-1848), Scottish poet, born in Aberdeen; became a factory weaver. His *Blind Boy's Pranks*, a bright lyri-

Thomas, one of Christ's twelve disciples, who doubted of the resurrection till convinced by sight and touch (John 20: 25 f.). The *Acts of Thomas* speak of his being sent to India. Lipsius's *Aporryphen Apostelgeschichte* (1883), vol. i., narrates his legendary history. See APOCRYPHA.

Thomas, Arthur Goring (1850-92), English musician and composer, was born at Ratton Park, Sussex. Having studied for two years in Paris, he entered the London Royal Academy of Music. His principal productions are the operas *The Light of the Harem* (1879), *Esmeralda* (1883), *Nadeshda* (1885), and *The Golden Web* (1893).

Thomas, Augustus (b. 1859), American dramatist, is a native of St. Louis. He became a journalist, and eventually proprietor of a newspaper in Kansas City. He is the author of several plays dealing with life in various American states, and succeeding admirably, by means of quiet realism and an evident grasp of character, in conveying the desired 'local colour.' Of these plays, two, *Alabama* and *Arizona*, have been performed in England.

Thomas, Charles Louis Ambrose (1811-96), French musical composer, born at Metz; gained the Prix de Rome (1832). He had achieved distinction as a composer in other branches before the production of his first opera, *La Double Echelle* (1837). This was highly successful, and was followed by numerous other important operatic works, amongst which *Mignon* (1866) is that best known in Britain. His other compositions include cantatas, choral scenes, chamber music, works for the piano, and part songs.

Thomas, Christians of St., an ancient Christian community in India, of Syrian origin, and Nestorian in doctrine. It numbers something less than half a million in Cochin and Travancore. The reputed founder is St. Thomas the apostle; but the church was probably a branch of the Persian Nestorians, introduced into India at the end of the 5th or the beginning of the 6th century. In 1599 a temporary union was effected with Rome. But in 1653 the Christians of St. Thomas again asserted their independence. The liturgical language is Syriac. Their sympathies are with the Greek Church.

Thomas, George (? 1756-1802), an Irish adventurer in India, was born in Tipperary, and in 1781 deserted at Madras from a British man-of-war. In 1788 he entered the service of the mogul of Delhi, which he left in 1792. By playing one prince against another, and making the most of the jealousies of Sikh and



Species of Thistles.

1. *Cirsium lanceolatum*, with floret. 2. *Cirsium vulgare*, with floret and scale of involucre. 3. *Cirsium acanthoides*, with floret and fruit. 4. *Cirsium acanthoides*, with floret and fruit. 5. *Oxygordium acanthium*, with floret.

which are eclectic, edifying, and suggestive, rather than original or profound, the following (nearly all translated) may be mentioned: *Briefe von Guido an Julian* (1825); commentaries on the *Epistle to the Romans* (1824), on the *Psalms* (1843), and on *John* (1844), etc.; also on the *Sermon on the Mount* (1845); *Die Propheten und*

real delineation of Cupid's whimsicalities, brought him patronage. Ultimately he became dissipated, and died in poverty at Dundee. In 1841 Thom published *Rhymes and Recollections of a Handloom Weaver*, which ran into several editions, and was re-issued in 1880, with a biography by W. Skinner.

Maratha, he established himself as an independent ruler. But his enemies at last united against him, and after a hard campaign he was captured, and escorted to the British frontier, carrying with him property worth two and a half lakhs (1802). He died on his way to Calcutta.

Thomas, GEORGE HENRY (1816-70), American general, was born in Virginia. He saw active service in Florida in 1841, and at Fort Brown, Monterey, and Buena Vista in 1846-7. From 1855 to 1860 he served in Texas. In 1861 he was made brigadier-general of volunteers, and in 1862 his levies won the battle of Mill Springs. He was no less successful at Perryville, Stone River, and Chickamauga, where he saved the Federals from complete disaster. In 1863 he commanded the army of the Cumberland, which stormed Missionary Ridge. In 1864 he commanded Sherman's centre, and later won the battle of Nashville.

Thomas, SIDNEY GILCHRIST (1850-85), English metallurgist and inventor, was born in London. He became a clerk in the police court, but devoted his leisure to studying chemistry, applying himself to the problem of the dephosphorization of pig iron in the Bessemer converter. He invented the basic lining of the converter made from magnesian limestone, and thus not only solved the problem but created the new substance basic slag. He took out his first patent (1877), but overwork ruined his health.

Thomas, THEODORE (1835), German violinist and conductor, born at Hanover; emigrated to New York in 1845; was first known as a violinist; became conductor (1862) of the Brooklyn Philharmonic Society; instituted (1864) an annual series of symphony concerts in New York, and later directed various musical festivals; from 1869 made occasional concert tours with his famous orchestra; 1878-80 was director of the College of Music, Cincinnati, and shortly afterwards again became conductor of the New York and Brooklyn Philharmonic Societies.

Thomas, WILLIAM (1832-78), Welsh poet, better known by his bardic name 'Islwyn,' was born at Ynysyddu in Monmouthshire, and was ordained (1859). He wrote a long Welsh poem, *The Storm* (translated in parts with other specimens of his muse in *Welsh Lyrics of the 19th Century*, 1896). His Welsh verse is of high quality. See collected edition, *Gweithiau Islwyn* (1846).

Thomas, WILLIAM LUSON (1830-1900), founder of the *Graphic* (Dec. 4, 1869). In London he set up as an engraver, utilizing his leisure in water-colour

painting. Twenty years later he launched the *Daily Graphic*, the first illustrated daily.

Thomas à Becket. See BECKET.

Thomas à Kempis. See KEMPIS.

Thomas Aquinas. See AQUINAS.

Thomasius, CHRISTIAN (1655-1728), German philosopher and jurist, was born at Leipzig. He became lecturer on law at Leipzig, being the first to use the vernacular in his lectures. This and his liberal views drove him from Leipzig to Halle (1690), where he was influential in forming a university. He is also memorable as an opponent of the witchcraft persecutions.

Thomas of Celano. See DIES IRE.

Thomas of Woodstock. See GLOUCESTER, DUKES AND EARLS OF.

Thomas the Rhymer. See ERILDOUNE.

Thomasville, tn., Georgia, U.S.A., co. seat of Thomas co., 200 m. s.w. of Savannah. It is a winter resort, and grows fruit and early vegetables. Pop. (1900) 5,322.

Thompson, SIR BENJAMIN, COUNT VON RUMFORD (1753-1814), was born at N. Woburn in Massachusetts. After the capitulation of Boston he retired to England, where he found employment in the Colonial Office. In 1784 he entered the service of the elector of Bavaria, who created him Count von Rumford (1794). On his return to England he devoted himself to utilitarian, social, and domestic reforms—smoking chimneys and such like—but also made scientific discoveries, being the first to demonstrate that heat is a mode of motion. He spent his fortune in the encouragement of scientific research in England and in the United States; persevered in his efforts to improve artillery; and founded the Royal Institution in 1799. A collected edition of his *Essays* was published in 1796-1802.

Thompson, EDWARD (1738-86), English seaman and poet, born at Hull. He was pressed into the navy in or about 1755, and served at the battle of Quiberon in 1759. In 1780 he commanded the *Hyena* in Rodney's action off Cape St. Vincent. Thompson was a familiar literary figure in London society, the friend of Johnson, Churchill, and Garrick. Among his publications were *A Sailor's Letters* (1767), *Trinculo's Trip to the Jubilee* (1769), and editions of the works of Sir John Oldham (1770), of Paul Whitehead (1777), and of Andrew Marvel (1776), and songs, including *The Topsail Shivers in the Wind*.

Thompson, SIR EDWARD MAUNDE (1840), principal librarian of British Museum, born in Jamaica. He was (1861) appointed assistant at British Museum, and (1878) keeper of MSS. and Egerton librarian, and principal librarian (1888). He was (1895-6) Sanders reader in bibliography, Cambridge. His works include editions of *Chronicon Anglie, 1328-88* (1874), *Chronicon Ada de Usk, 1377-1404* (1876), *Robertus de Avesbury de Gestis Edwardi III.* (1889), *Handbook of Greek and Latin Palaeography* (1893).

Thompson, ELIZABETH AND ALICE. See BUTLER and MEYNELL.

Thompson, SIR HENRY (1820-1904), English surgeon, was born at Framlingham in Suffolk. He specialized in the surgery of the genito-urinary tract, and especially in lithotomy and lithotripsy. He also won laurels in art, literature, and astronomy, and endowed the National Observatory at Greenwich with some of its finest instruments. Sir Henry was created a baronet in 1899.

Thompson, SIR JOHN SPARROW (1844-94), premier of Canada, was born at Halifax, Nova Scotia. He entered the Nova Scotia House of Assembly in 1877, and became attorney-general (1878) and premier (1881). After the defeat of his administration he became a judge of the Supreme Court of Nova Scotia (1882), but resigned in 1885, to enter Dominion politics and become minister of justice. In 1892 he became prime minister of Canada, and acted as one of the arbitrators in the Bering Sea case (1894).

Thompson, LYDIA (1838), English actress, born in London. Having a talent for comedy, she figured in 1854 in *King's Rival*; as Silver-hair in *Harlequin*; in *Little Bo-Peep*; in *Cupid's Ladder* (1859); as Norah in *Woman* (1861); in *Magic Toys* in the early 'sixties. In America she was enormously popular, and all the more for having whipped a censorious editor, for which she was fined 2,000 dollars.

Thompson, SILVANUS PHILIPS (1851), English physicist, was born at York. After holding for nine years the chair of experimental physics in University College, Bristol, he became in 1885 principal and professor of physics in the (London) City and Guilds Technical College, Finsbury. He has accomplished a great deal of useful research work, chiefly in optics, electricity, and magnetism. His *Electricity and Magnetism* (1881; last ed. 1901) ranks as one of the best elementary and practical books on the subject; and unique in their way are his treatises on the *Electro-magnet* (1891)

and *Dynamo-electric Machinery* (1885; 7th ed. 1904-5). Of his other works may be mentioned *Michael Faraday* (1898); *Light, Visible and Invisible* (1897); *Design of Dynamos* (1903).

Thompson, SIR THOMAS BOULDEN (1766-1828), British admiral, whose original name was Thomas Boulden, was present at Rodney's victory off Cape St. Vincent in 1780, at Nelson's attack on Santa Cruz in 1797, and at the battle of the Nile, and was subsequently captured by the *Généreux* after a splendid defence. In 1801 he was severely wounded at the battle of Copenhagen. In 1806 he was made a controller of the navy and a baronet. In 1816 he became treasurer of Greenwich Hospital. He attained the rank of vice-admiral in 1814.

Thompson, WILLIAM ('Bendigo') (1811-89), pugilist, champion of England (1839), was born at Nottingham. He beat 'Deaf' Burke in 1839, and Benjamin Caunt in 1845.

Thoms, WILLIAM JOHN (1803-85), English antiquary and bibliographer, was born in Westminster. From being clerk of the Treasury he became clerk (1845) and deputy-librarian (1863) to the House of Lords. From 1849 he edited *Notes and Queries*. His publications include *Early Prose Romances* (1827-8), *Lays and Legends of France, Spain, etc.* (1834), and *Human Longevity* (1873).

Thomsen, JULIUS (1826), Danish physicist, was born in Copenhagen; appointed assistant in the chemical laboratory at the Polytechnic in 1847; professor of physics in the Military Academy in 1859; and professor of chemistry in the University of Copenhagen in 1866—a post from which he retired in 1901. Thomsen's great work has been in investigating the heat changes that take place in chemical action, the results of which have been published as *Thermochemische Untersuchungen* (4 vols. 1882-6).

Thomsen, WILHELM LUDWIG PEDER (1842), Danish philologist, born at Copenhagen; since 1871 professor of comparative philology at the University of Copenhagen. Perhaps his greatest feat was the interpretation of the old Turki inscriptions at Orkhon in Mongolia, which had baffled every previous investigator. In 1877 he delivered a course of lectures at Oxford, under the title of *The Relations between Ancient Russia and Scandinavia*. He also wrote *Det Magyariske Sprog* (1867), *Den Gotiske Sprogklassens Indflydelse paa den Finske* (1869), *Ueber den Einfluss der Germanischen Sprachen auf die Finnisch-Lappischen*, which gained the Bopp prize of the Academy of Sciences at Berlin in 1870.

Thomson, ALLEN (1809-84), Scottish biologist, was born in Edinburgh. From 1831-6 he was an extra-mural lecturer on physiology and anatomy in Edinburgh. In 1839 he became professor of anatomy at Aberdeen, in 1842 of physiology at Edinburgh, and in 1848 of anatomy at Glasgow, where he remained till he resigned in 1877. He was the first of the great biologists of the 19th century, but lacked originality.

Thomson, SIR CHARLES WYVILLE (1830-82), Scottish naturalist, was born at Bonsyde, Linlithgow; held the chair of botany at Aberdeen (1850), of natural history at Cork (1853), of geology at Belfast (1854), and of natural history at Edinburgh (1870). His *Voyage of the 'Challenger'* (1880) is a record of the famous scientific expedition conducted by him, and *The Depths of the Sea* (1873) gives the results of earlier investigations.

Thomson, GEORGE (1757-1851), Scottish collector of songs, was born at Limekilns, Fifeshire. He entered the Board of Trustees, rising eventually to a chief clerkship. He published *Scottish Songs* (6 vols.), *Welsh Songs* (3 vols.), and *Irish Songs* (2 vols.), arranged with accompaniments by prominent musicians of the period, including Haydn, Beethoven, and Weber.

Thomson, JAMES (1700-48), Scottish poet, author of *The Seasons*, was born at Ednam in Roxburghshire. Setting out for London in 1725, he found there Malloch or Mallet; and his poem *Winter* appeared in March 1726. At the end of May 1726 Thomson was appointed tutor to the son of the Duke of Montrose. In 1727 he published *Summer*, a poem to the memory of Sir Isaac Newton, and (anonymously) *Britannia*, in which he inveighed against the administration of Walpole. In 1728 appeared *Spring* and his tragedy of *Sophonisba*, a frigid drama, which provoked much mirth and more than one parody. In 1730 appeared *Autumn*. In 1731 he went abroad as tutor to young Talbot, son of the future lord chancellor; and the fruit of these travels was his longest poem *Liberty*, the first part of which appeared in 1734. In 1733 the chancellor gave Thomson the sinecure of secretary of the briefs in the Court of Chancery. The second and third parts of *Liberty* were published in 1735, the fourth and fifth in the following year. Then Thomson lost his sinecure, and was arrested for debt. In 1738 appeared his *Agamemnon*, another conventional drama, the real interest of which is its political innuendo. Thomson's next play, *Edvard and Eleanora* (1739), was rejected for the stage.

The *Masque of Alfred*, the joint composition of Thomson and Mallet, was represented in 1740; it contained *Rule, Britannia*, unquestionably by Thomson. He received another sinecure of £300 in 1744. Next appeared *Tancred and Sigismunda* (1745), a play founded upon a story in *Gil Blas*, and in 1748 the *Castle of Indolence*, the work, at intervals, of fifteen years. It is the most finished of Thomson's works—in the archaic manner of Spenser, and in the Spenserian stanza. After his death his *Coriolanus*, finished in 1747, was put on the stage; it is a bold but most abortive attempt to rival Shakespeare's play. Thomson excelled more in descriptions than in episode or reflection; yet the *Castle of Indolence* has characterizations of a very high order. Johnson's account of him (*Lives of the Poets*, 1781) is marred by prejudice. There are *Lives* by Sir Harris Nicholas (Aldine Poets, 1831), D. C. Tovey (Aldine Poets, 1897), and an excellent and exhaustive biography and criticism in French by Léon Morel (1895).

Thomson, JAMES (1822-92), Scottish engineer, was born in Belfast. In 1857 he became professor of civil engineering in Queen's College, and in 1873 in Glasgow University. He made researches regarding water-wheels, and in 1850 patented the vortex water-wheel; and was for years engaged in researches dealing with the plasticity of ice, and with crystallization and liquefaction as influenced by stresses.

Thomson, JAMES, (1834-82), Scottish poet, was born at Port-Glasgow. In 1862 he secured a post as solicitor's clerk. In 1872 he was in America as a mining agent; in 1873 he represented the *New York World* with the Carlists in Spain; and from 1875 his precarious living was mainly gained from *Cope's Tobacco Plant*. He now became dissipated, pessimistic, and ill. *The City of Dreadful Night* and other Poems appeared in 1880, and *Vane's Story and Essays and Phantasies* in 1881. Posthumous publications are *A Voice from the Nile*, with memoir by Bertram Dobell (1884); *Shelley, a Poem* (1885); *Biographical and Critical Studies* (1896). Thomson has depth, subtlety, suggestiveness, and adequate command of form. 'B. V.' was his signature in periodicals. See Salt's *Life of James Thomson* (B. V.) (1889); B. Dobell's *Memoir* (1884).

Thomson, JOHN (1778-1840), Scottish artist and minister, was born at Dailly, Ayrshire, and became minister of Dailly (1799) and of Duddingston (1805). Here he took his place as the greatest Scottish landscape painter of his

time. He is well represented in the Scottish National Gallery. See Baird's *Life of Thomson* (1895).

Thomson, JOHN ARTHUR (1861), biologist and writer on natural history, a native of Haddingtonshire, was educated at the University of Edinburgh and at Berlin. He was for some time attached to the Edinburgh School of Medicine as lecturer on zoology and biology, and was appointed to the chair of natural history at Aberdeen University (1899). His written works include *The Evolution of Sex*, with P. Geddes (3rd ed. 1901), *Outlines of Zoology* (3rd ed. 1899), *Progress of Science in the 19th Century* (1904), and *Herbert Spencer* (English Men of Science Series, 1906).

Thomson, JOSEPH (1858-94), Scottish traveller and explorer, was born at Penpont in Dumfriesshire. In 1878 he joined the Keith-Johnston expedition to East Central Africa as geologist, and on the death of the leader took command. The Royal Geographical Society in 1882 entrusted him with another African expedition, and three years later he undertook a mission for the National African Company. Thomson explored Morocco, and in 1890 served under the British South African Company. His books include *Through Masai Land* (1885), *Travels in the Atlas* (1889), *To the Central African Lakes* (1881), and *Mungo Park and the Niger* (1890).

Thomson, JOSEPH JOHN (1856), Scottish physicist, was born near Manchester. He studied at Owens College and at Cambridge, where he came under the influence of Clerk Maxwell. He became Cavendish professor of experimental physics at Cambridge in 1884, and has established one of the most famous schools of experimental physics in the world. The difficult problems connected with the discharge of electricity through gases were attacked both experimentally and theoretically, and largely through his own researches, as well as those of students working under him, the properties of the electrons or charged corpuscles which enter into the constitution of the molecule were elucidated, and made the foundation of a convection theory of electricity. Thomson has embodied much of his own work in *Recent Researches in Electricity and Magnetism* (1892), *Discharge of Electricity through Gases* (1897), and *Conduction of Electricity through Gases* (1903). He has also published *Motion of Vortex Rings* (1884), an important work on the *Application of Dynamics to Physics and Chemistry* (1886), and *Electricity and Matter* (1904).

Thomson, WILLIAM (1819-90), archbishop of York, was born at Whitehaven. He became tutor, and eventually provost (1855), of Queen's College, Oxford. He was appointed bishop of Gloucester in 1861, and shortly afterwards archbishop of York. Thomson proved himself a leader in church legislation, a powerful preacher, and liberal in his attitude towards the social questions of the day. He wrote *Outline of the Laws of Thought* (1842).

Thomson, WILLIAM. See KELVIN, LORD.

Thomson, WILLIAM M'CLURE (1806-94), American missionary and author, born near Cincinnati. A missionary in Syria and Palestine (1833-49, 1850-7, 1859-76), he published *The Land and the Book* (3 vols. 1880-3) and *Land of Promise* (1865).

Thomson Effect. See ELECTRICITY, CURRENT (vol. iii. p. 2161).

Thor. See MYTHOLOGY, NORTHERN.

Thoracic Duct, begins in the abdomen, close in front of the spinal column at the level of the second lumbar vertebra, as the receptaculum chyli, and running upwards to the root of the neck curves a little to the left, and arches over to empty itself into the venous blood-stream at the junction of the left internal jugular and subclavian veins. It is mostly about the diameter of a goose quill, and its contents are mixed lymph and chyle.

Thoracostraca. See CRUSTACEA.

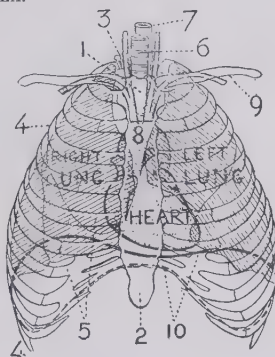


Diagram of Thorax.

1. Top of sternum; 2. ensiform cartilage; 3. first dorsal vertebra; 4. ribs; 5. costal cartilages; 6. trachea; 7. esophagus; 8. aorta; 9. clavicle; 10. median transverse line and line of attachment of diaphragm.

Thorax. The thorax, or chest, lies between the neck above and the abdomen below, being separated from the latter by the diaphragm. The organs in the thorax are the heart and the lungs. The trachea, or windpipe, and the oesophagus, or gullet, pass

into it from above. Children soon begin to show the effects of a rickety constitution by characteristic markings on the chest wall—namely, a chain of prominences known as the 'rosary.' Children also tend to develop 'pigeon chest' if they suffer for any length of time from any throat or lung trouble which makes inspiration difficult. Spinal disease also alters the shape of the chest, and with spinal curvature lessens the breathing capacity. Flat chest is the result of incomplete inflation of the lungs. On the other hand, an exaggerated roundness, giving a barrel-like appearance, with a certain rigidity or lack of elasticity in the chest wall, is due to a pathological enlargement of the lung. Another common deformity of the thorax is that produced by corsets. Their tendency is to compress the liver and the stomach against the diaphragm, which is therefore pushed upwards, and thus the chest capacity is lessened. The heart's action is often seriously impeded, and the abdominal organs become deformed.

Thorbecke, JAN RUDOLF (1798-1872), Dutch politician, born at Zwolle (Overijssel). At Giessen he lectured and published *Ueber das Wesen der Geschichte* (1824), followed some months later by his powerful *Bedenkingen aangaande het Recht en den Staat*, which secured for him a chair in Ghent University (1825), whence he went to Leyden (1831) as professor of jurisprudence. He was leader of the new reform party in Holland. His principal work is *Aanteekening op de Grondwet* (1839). See *Lives* by Buys (1876) and J. A. Levy (1876).

Thoreau, HENRY DAVID (1817-62), American writer, was born at Concord in Massachusetts, and was rarely, and then only for brief periods, away from his native region. He ignored mankind as much as possible; avowed that the animal creation was better company than his fellowmen, and that the life of solitary isolation in the midst of uncultivated wastes was superior to that in any human community. His *Walden*, the *Excursions*, and perhaps the *Letters*, contain the most vital part of Thoreau's thought and individual observation. He is the greatest of the poet-naturalists of America, perhaps the greatest nature writer of any country. He has little of the winsome charm of Gilbert White, little of the vivid beauty of Richard Jefferies; but as an original mind in contact with nature he stands alone. His principal works were: *A Week on the Concord and Merrimack Rivers* (1849), *Walden, or Life in the Woods* (1854), *Excursions* (1863), *The*

Maine Woods (1864), *Cape Cod* (1865), *Letters and Poems* (1865), *A Yankee in Canada* (1866). See Sanborn's *Life* (in the American Men of Letters Series, 1882), W. E. Channing's *Thoreau* (1873), Emerson's fine essay, H. A. Page's preface to *Walden* (Camelot Classics, 1895), and essays or critiques by Lowell, Henry James, Nichol, and Burroughs.

Thoren, afterwards THORILD, TOMAS (1759–1808), Swedish author, born at Kongelf in S. Sweden. In 1772 a poem on *The Passions* led to a fierce polemic between himself and Kellgren; and he founded a literary journal, *Den nye Granskaren*, to air his peculiar views, which aimed at more liberty in literature than the classical school was willing to allow. He repaired to England (1788) to study the English constitution, which he pronounced a fraud. In 1793 he was prosecuted for transgressing the press laws by his pamphlet, *Arligheten*, and banished for four years. His *Samlade Skrifter* were edited by Hanselius (1874–80). See Geijer's *Thorild* (1820).

Thorium, Th, 232.5, a metallic element of the tin group, occurring principally in thorite and other rare minerals. It has been isolated by displacement by potassium from potassium fluothorate, and forms an infusible gray metallic powder of specific gravity 11.2. It burns brightly in oxygen, and is chiefly important in its oxide, ThO₂, which forms a series of salts. Of these, thorium nitrate when heated strongly yields thorium oxide again—a fact made use of in the manufacture of mantles for incandescent gas light, which are prepared by soaking a loose cotton fabric in the salt and igniting. The best result is obtained with a mixture yielding thorium oxide with about one per cent. of cerium oxide. Thorium also emits radiations and emanations like, though not identical with, those given out by radium.

Thorn, fortified tn., Prussia, prov. W. Prussia, on r. bk. of Vistula, 87 m. by rail N.E. of Posen; has manufactures of machinery and boilers, tobacco, and soap. It possesses an ancient castle, and was the birthplace of Copernicus (1473). Pop. (1900) 29,635.

Thorn Apple. See DATURA.

Thornback. See SKATE.

Thornbury, GEORGE WALTER (1828–76), English writer, was born in London. To him we owe the *Life of Turner* (1863). His other writings include *True as Steel* (1863), *Life in Spain* (1860), *Life of Turner* (1862), and *Songs of the Cavaliers and Roundheads* (1857). Thornbury died in an asylum.

Thorne, SIR RICHARD THORNE (1841–99), exponent of public hygiene, was born at Leamington; acted (1869–71) as assistant physician to the London Fever Hospital; principal medical officer to the Local Government Board (1892); permanent lecturer on public health at St. Bartholomew's, London. K.C.B., 1897. His Milroy Lectures on diphtheria were published in 1891.

Thornhill. (1.) Urban dist., W. Riding, Yorkshire, England, 1½ m. S. of Dewsbury; has ancient church of St. Michael. Pop. (1901) 10,290. (2.) Village, Nithsdale, Dumfriesshire, Scotland, 14 m. N.W. of Dumfries; has sandstone quarries (Closeburn). Drumlanrig Castle, one of the seats of the Duke of Buccleuch, is in the vicinity. Pop. (1901) 1,132.

Thornhill, SIR JAMES (1675–1734), English painter, was born at Melcombe Regis. His decorative work adorned Greenwich Hospital as well as the palaces of Windsor and Hampton Court. He also designed and executed paintings for the interior of the dome of St. Paul's Cathedral. Thornhill in 1720 received knighthood (being the first native artist to receive that honour), and was appointed court sergeant painter. He executed portraits, and founded a school of art, of which Hogarth became a pupil.

Thorns. (1.) A name given to various species of *Cratægus*, *Prunus*, *Acacia*, and other genera of shrubs—i.e. hawthorn, blackthorn, whitethorn. (2.) The sharp processes, needles, or spines with which many plants are armed.

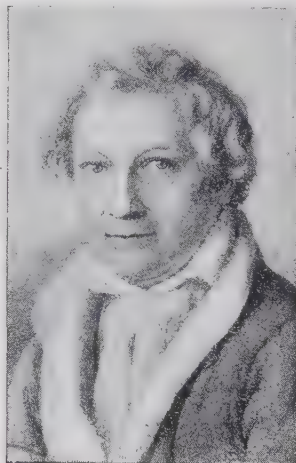
Thornton, SIR EDWARD (1817–1906), British diplomatist, born in London. In 1851 he was made secretary of legation in Mexico, and in 1852 became secretary to a special mission to the River Plate. In 1859 he was minister plenipotentiary to the Argentine Confederation, in 1865 to Brazil, in 1867 to the United States of America, in 1881 to Russia, and in 1884 to Turkey, from whence he retired in 1886. In 1870 he acted as arbitrator in the case of the United States vessel *Canada*.

Thornycroft (1843), SIR JOHN ISAAC, British naval architect and engineer, was born at Rome. In 1863 he designed the *Ariel*, forerunner of the modern torpedo boat, and in 1866 founded ship-building works at Chiswick. To the improvements he effected in naval architecture and marine engineering is due the development of high speeds at sea. He is a leader in the self-propelled vehicle movement.

Thornycroft, W. HAMO (1850), English sculptor, holds an important place in the modern revival of English sculpture. In 1872 he worked with his father

on the fountain in Park Lane. In 1881 he exhibited his *Tewoe* (Tate Gallery), and was elected A.R.A., and in 1888 R.A. Influenced by classical sculpture, his ideal is 'the pursuit of imaginative aims under forms of absolute truths.' His finest works are his statues to *General Gordon* (London and Melbourne), *Cromwell* (Westminster Hall), the *Stanley Memorial* (Holyhead), *King Alfred* (1901), *The Mower* (Liverpool), *Gladstone* (London).

Thoroddsen, JON (1819–68), Icelandic poet and novelist, born at Reykholur, and became a district sheriff. His poems are mostly of a satirical and humorous type. His principal novels are *Filtur og Stulka* ('Lad and Lass'), a tale of country life, and *Mathurog Kona* ('Man and Wife'). They have been exceedingly popular.



Bertel Thorwaldsen.

Thorough Bass, or FIGURED BASS, is a kind of musical shorthand, in which the nature of a chord is indicated by one or more figures placed over or under a given bass note.

Thorpe, BENJAMIN (1782–1870), English Anglo-Saxon scholar; studied at Copenhagen under Rask, whose Anglo-Saxon grammar he translated into English (1830). In this year he returned to England, and commenced to issue the long series of Anglo-Saxon texts beginning with *Cædmon* (1832), and including *Beowulf* (1855) and the *Anglo-Saxon Chronicle* (1861, Rolls Series). He translated into English Lapenberg's *History of England under the Anglo-Saxon Kings* (1845) and Pauli's *Life of King Alfred* (1854), and published *Northern Mythology* (1851), and *Fyfe Tide Stories* (1853), and in

1865 his supplement to Kemble's *Codex Diplomaticus Aevi Saxonici*.

Thorpe, THOMAS EDWARD (1845), English chemist, was born near Manchester. After holding the chair of chemistry in Anderson's College, Glasgow (1870), Yorkshire College, Leeds (1874), and Royal College of Science, London (1885), he was appointed to the directorship of the government laboratories. Thorpe's principal research work has been on the paraffin hydrocarbons, the oxides of phosphorus, hydrogen fluoride, and the derivatives of phosphorus and fluorine. He has written *Essays in Historical Chemistry* (1894), *Life of Hum-*

sculpture; his attempts at Christian art were less fortunate. Much of his best work is in England, such as his *Lord Byron at Cambridge*. His bas-reliefs of *Night* and *Morning* have had a long popularity, and his colossal *Memorial Lion* carved in the Bernese rock is familiar to all travellers in Switzerland. See Plon's *Thorwaldsen* (Eng. trans. 1874); *Life* by Thiele (Eng. trans. 1865); and *Life* in Danish by S. Müller (1893).

Thoth, an Egyptian divinity, corresponding to the Greek Hermes Trismegistus and the Roman Mercury. He was the god of writing and the presiding deity of libraries in Egypt; also the

dued all the countries from Nile to Euphrates. He made and inscribed with his 'own name the obelisk 'Cleopatra's Needle.' (4.) THOTHMES IV. succeeded Amenhotep II. He is the king who is mentioned on the tablet between the fore paws of the Sphinx.

Thou, or THUANUS, JACQUES AUGUSTE DE (1553-1617), French historian, was born at Paris. In 1604 he began to issue *Historia mei Temporis*, a chronicle of events between 1543 and his own time; it was continued (1614). At thirty-five he was president of the Parlement of Paris, and was in great favour with Henry III. and Henry IV., the latter ap-



Ancient Thrace.

phry Davy (1895), and Joseph Priestley (English Men of Science Series, 1906); whilst he edited a *Dictionary of Applied Chemistry* (1890-3).

Thorwaldsen, BERTEL (1770-1844), Danish sculptor, born in Copenhagen. In 1796 he went to Italy. His first success was a statue of *Jason*. After twenty-three years in Rome, he returned to Denmark, and for the Copenhagen church of Our Lady executed colossal statues of *Christ and the Twelve Apostles*. He bequeathed his fortune to build and endow the Copenhagen Museum, and left to it his collection of works of art and models of all his statues. He was a most successful imitator of classical

inventor of the arts, sciences, and astronomy. He also kept a record of the actions of the dead. He is usually represented ibis-headed.

Thothmes, or THUTMES, the name of four monarchs of Egypt of the 18th dynasty (1587-1328 B.C.). (1.) THOTHMES I. was a great warrior, who made expeditions into Palestine and Mesopotamia. He also waged war with the Syrians, and penetrated into the heart of Nubia. (2.) THOTHMES II. was raised to the throne by his sister and wife Hatshepsut, to whom the kingdom had been left by her father, Thothmes I. (3.) THOTHMES III., or 'The Great,' under whom Egypt reached its pinnacle of prosperity. He sub-

pointing him keeper of the Royal Library. See *Life* in French by Chasles (1824), and in German by Düntzer (1837).

Thought-reading, or MIND-READING. See PSYCHICAL RESEARCH.

Thourout, tn., W. Flanders, Belgium, 11 m. s.s.w. of Bruges; manufactures hats and linen and woollen goods. Pop. (1900) 10,146.

Thousand and One Nights. See ARABIAN NIGHTS ENTERTAINMENTS.

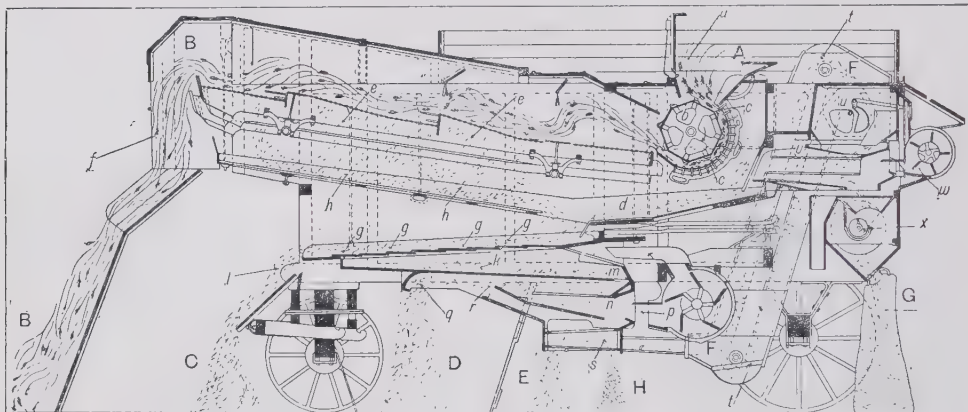
Thousand Islands, group (1,500) of picturesque islets in the St. Lawrence R., between Ontario, Canada, and Jefferson co., New York, U.S.A.; are favourite summer resorts.

Thrace, in antiquity, a country in the s.e. of Europe, bounded on the e. by the Black Sea, on the s. by the Sea of Marmora and the Ægean, on the n. by the Danube; while on the w. the river Strymon—now the Struma—was usually the dividing line between Thrace and Macedonia. The Romans divided it into two provinces, confining the name Thrace to the region s. of Hæmus. Greek legend represented the earliest Greek poets—Orpheus, Linus, Musæus, and others—as Thracians; while the Thracians of historical times are described as barbarians, and they served the Greeks as slaves and as mercenaries. Greek colonies—

oligarchic revolution of 411 B.C. That year he won the naval victory of Cynossema over the Peloponnesians, and in the next, along with Alcibiades, that of Cyzicus. After Athens fell into the hands of the 'thirty tyrants' he headed a band of exiles who expelled the 'thirty tyrants' from Athens. He then restored the democracy. Having conquered Lesbos and defended Rhodes, he was killed at Aspendus in 388 when in command of an expedition against Persia.

Thrasymachus, of Chalcedon, a Sophist in ancient Greece during the 5th century B.C. He is introduced by Plato as an interlocutor in the *Republic*, where

years' penal servitude, with intent to extort; or (3) to compel a person, by violence or threats, to execute a deed with intent to defraud, is in each case a felony punishable by penal servitude for life. It is a felony punishable by three years' penal servitude to demand property with threats or by force, with intent to steal. By the Libel Act, 1843, to publish or threaten to publish a libel with intent to extort money, or with the object of securing an appointment, is an offence punishable by three years' imprisonment. The extortion of hush money under threat of exposure, especially of a baseless charge, is termed blackmailing. Sending letters contain-



Modern Threshing Machine.

The sheaves are broken up by hand at *a*, thrown into the drum mouth *a*, drawn in by the drum *b*, and beaten against the concave *c*. Part of the corn and chaff fall on the middle plate *d*, while the straw *e* passes to the shakers *e*, which move in alternate sections both vertically and horizontally, causing the straw to pass out at *f*. The corn and chaff shaken out of the straw fall through the shakers and the plate *h* to the riddles *g*, which have a slow reciprocating horizontal motion. The short pieces of straw known as 'cavings' *c* pass out at *i*, while the corn, chaff, and dust fall on the plate *k* and the opening *m*, where a current of air from the fan *p* blows the light chaff *d* out at *q*; the somewhat heavier cobs or unthreshed ears *s* fall on the slope *r* and pass out underneath. The heavy corn and dust fall down the slope to the sieve or riddle *s*, which allows the dust *u* to fall out, but retains the corn *r*, and passes it to the elevator *t*, which lifts it to the screen *u*. Here the small and imperfect grains are separated from the best and passed out at a special spout, while the best grain falls on the riddles *w*, passing through another air blast from the fan *v* to the dressing-box *x*, where it is brushed and polished, and finally delivered as clean grain *g* into the sack *y*.

Amphipolis, Abdera, Maronea, Mesembria, Ænos, Perinthos, Selymbria, Byzantium, and others—lined the whole southern coast; and others, such as Apollonia and Tomi, existed on the eastern coast. The Thracians spoke an Aryan tongue, more or less akin to Teutonic. They were conquered by the general of Darius, king of Persia, about 515 B.C.; but after the defeat of the Persians (480 B.C.) by the Greeks they were independent, until Philip of Macedon conquered them in 342–341 B.C. Rome's defeat of Macedonia made them her subjects.

Thrale, MRS. See PLOZZI.

Thrasea. See PÆTUS.

Thrashing. See THRESHING.

Thrasimene. See TRASIMENE.

Thrasylbulus, Athenian statesman of the latter part of the 5th century B.C. He headed the resistance at Samos to the

he argues strongly for the sophistical doctrine that 'might is right.'

Thread. See YARNS, COTTON (SPINNING), and SCREW.

Thread Cells. See STINGING-CELLS.

Threadneedle Street, in early times also THREE-NEEDLE STREET, City of London, named from the circumstance that the Merchant Taylors' Company have their hall in it. It extends from Bishopsgate Street to the Bank of England, 'the old lady in T.S.'

Thread-worms, a popular name for nematodes.

Threats. (1) To send, with knowledge of the contents and without reasonable or probable cause, a letter demanding money or property with threats; or (2) to accuse, or threaten to accuse, a person, by letter or otherwise, of any abominable crime, or crime punishable by upwards of seven

ing threats of murder is punishable by ten years' imprisonment.

Three-Colour Process. See PRINTING and PROCESS WORK.

Three Kings, FEAST OF. See TWELFTH DAY.

Three-phase Electric Working. See DYNAMO.

Three Rivers, tn., prov. Quebec, Canada, between Quebec and Montreal, at junction of St. Lawrence and St. Maurice. It trades in lumber. Pop. (1901) 9,981.



Thresher, or Fox-shark.

Thresher, or FOX-SHARK (*Alopius vulpes*), a member of

the porbeagle family (Lamnidae). The upper lobe of the tail is as long as the rest of the body. The fox-shark is widely distributed in the Atlantic and Pacific Oceans, and is the commonest shark off the British Islands. It reaches a length of fifteen feet, and is quite harmless to man but excessively destructive to small fish, such as pilchards, herrings, and sprats.

Threshing, or **THRASHING**, consists in separating the grain from the straw. This was originally done by means of a 'flail,' or by treading with horses or oxen, and the separation of the grain from the chaff was then completed by the wind. It is about a hundred years since 'Andrew Meikle, an ingenious Scottish mechanist, produced a threshing-machine so perfect that its essential features are retained unaltered to the present day' (Wilson's *British Farming*, 1862). Horse power has now given place to steam, and the actual threshing has been complicated by appliances for winnowing, screening, hummelling, and weighing up the dressed corn ready for market. In the most modern sets an elevator is attached for stacking the straw and bolting, and chaff-cutting machinery for tying the straw into bundles or cutting it up for fodder are provided. The essential threshing or beating out of the grain is performed by a drum, consisting of iron rods firmly fixed across wheels, placed at intervals along a strong iron axis. These are further provided with six grooved steel beaters, placed parallel to one another and to the axis, and at right angles to the plane of revolution. The drum revolves from 800 to 1,000 times in a minute, and the beaters are thus made to strike the straw from 4,800 to 6,000 times per minute. The straw is retained in position by an iron or steel concave, which can be regulated to any required distance from the revolving drum. The grain is received upon perforated trays, which allow it to fall on receiving boards, and these carry it to the winnowers; while the straw is carried along 'shakers,' and is delivered to the elevator, and from thence to the straw stack. The grain is, after winnowing, carried by elevators furnished with cups, and passed through screens, white coaters, and hummellers, to the delivery spouts, and received in sacks. The actuating power is generally an 8-h.p. portable engine, which is connected with the threshing-machine by a 60-foot belt carried over the fly-wheel of the engine and the drum pulley or sheave. The difference between the diameter of the fly-wheel and that

of the drum pulley accelerates the speed of the latter to the required velocity.



Thrift.
1, Single flower; 2, pistil.

Thrift, a name given to certain plants belonging to the genus *Armeria*, a subdivision of the order Plumbaginaceæ. The common thrift of sea-shores is *A. maritima*, the sea-pink; it bears downy, leafless flower-stalks, surmounted by globular heads of pinkish flowers in summer. Thrift is much used in gardens as a neat, compact, edging plant.

Thring, EDWARD (1821-87), English schoolmaster, born at Alford, Somerset. In 1853 he was appointed headmaster of Uppingham, then an insignificant school of twenty-five boys; and in the course of his rule of thirty-four years he raised it to a high rank among the public schools of England. His writings include *Thoughts on Life Science* (1869), and *The Theory and Practice of Teaching* (1883). See *Life* by Parkin (1898).

Thrips, a genus of insects belonging to the order Thysanoptera. The species are minute, and generally have suckling mouths. Many species attack corn, where they damage the inflorescence; while in hothouses they destroy the leaves of plants. By gardeners thrips are sometimes called 'black fly,' in distinction to the aphides, or 'green fly.' The larva does not differ greatly from the adult either in appearance or in habits. Parthenogenesis occurs, and both winged and wingless females are known.

Throgmorton, SIR NICHOLAS (1515-71), British diplomatist. He was implicated in Wyatt's plot and for a time imprisoned. On the accession of Elizabeth he went as ambassador to France, where his Protestant tendencies involved him in difficulty. He was afterwards ambassador to Mary Queen of Scots.

Thrombosis is the coagulation of fibrin in the heart, blood vessels, or lymphatics during life. Most thrombi are produced slowly. A thrombus may become organized and adherent to the vessel wall, it may soften and suppurate, or it may form a phlebolith. Until a thrombus is organized there is grave danger that it may extend or travel to the large venous trunks or even to the heart. Lymphatic thrombi occur chiefly during the puerperal state. The treatment necessarily varies with the situation of the vessel affected, but in most cases rest is essential.

Thronthjem. See **TRONDHEIM**.
Throw, the radius of the crank-pin circle in an engine. The throw of the eccentric is the radius of the eccentric circle. The term is sometimes applied to the diameter of the circle.

Throwing the Hammer. See **ATHLETIC SPORTS**.

Thrush (*Turdus*), a large genus of song-birds, including several British forms. In all the true thrushes the breast is more or less spotted at all ages, the beak is moderate, the wing and tail long. The nest is composed partly of mud. The song-thrush, thrushle, or mavis (*T. musicus*) has a length of about nine inches. The male is dark brown above, with buff tips to the wing coverts; the under surface is tawny on the breast and sides, spotted with dark brown. The eggs number from four to six, and are bright blue, spotted with dark brown. In addition to fruit in season, large numbers of snails are eaten, as well as earthworms, insects, and, near the sea, small marine



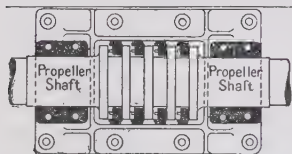
Song-Thrush.

molluscs. The song is very sweet. Like its allies, this thrush is often used as food. Other members of the genus are the missel-thrush, redwing, and fieldfare, while the blackbird is closely allied. The members of the genus are widely distributed, being most abundant in S. America. The *Turdidæ*, or

thrush family in the large sense, includes also the chats, warblers, and mocking-birds.

Thrush, a small ulcer produced by inflammation of the mouth, due to a parasitic fungus, *Oidium albicans*. It is characterized by numerous white flakes of exudation from points of acutely-inflamed mucous membrane below. The disease is commonest in young children, but occurs also in the old, and in the subjects of phthisis and other wasting diseases. The mouth and tongue should be washed frequently with a weak solution of boric acid, or with borax and glycerin; and in the case of children at the breast, the mother's nipples should be treated in the same way. Feeding-bottles should be kept scrupulously clean, and the child should have a mild purgative like castor oil. In older patients, stronger antiseptics may be required, such as sodium sulphate.

Thrush. See HORSE—Diseases of.



Thrust-block.

Thrust-block, in screw steamships, the block that takes up the whole push of the propeller—i.e. the whole force which drives the ship. The propeller shaft is made with a series of collars which fit into spaces in the block, and so distribute the enormous force over a wide area in the block. The pressures should be not more than about 75 lbs. per square inch for high speeds, and 90 lbs. for low.

Thuanus. See THOU, DE.

Thucydides (c. 465–c. 400 B.C.), Greek historian, was a native of Athens. In 424 B.C. he was one of the ten *strategi* or chief officials of Athens, and with a colleague (Eucles) was entrusted with the management of affairs in Thrace. However, he failed to prevent Brasidas, the Spartan general, from seizing Amphipolis, though he was in time to secure Eion, its port, and defended it against two attacks. In consequence he was banished from Athens, and remained in exile twenty years. He probably returned to Athens in 403 B.C. His work is the *History of the Peloponnesian War*, which, however, is unfinished; it breaks off suddenly at the summer of 411 B.C. The period really covers three wars—that between Athens and Sparta and their allies, from 431 to 422 B.C., ended by the peace of Nicias; then the Sicilian expedition of

Athens from 415 to 413 B.C.; and lastly, the renewed war between Sparta and Athens from 415 to 404 B.C. As a writer of history Thucydides has never been surpassed. Herodotus is a story-teller; Thucydides is a critical historian. He knows what authorities to use and how to use them; he appreciates the difficulty of obtaining consistent accounts even from eye-witnesses, and therefore compares all the evidence he can get, and combines it into a reasonable whole. His history is 'a possession for ever,' because of his political wisdom and insight into human character rather than from the intrinsic interest of the events. Thus his speeches, the insertion of which has been criticised as being in no case the actual words spoken, and in some purely dramatic orations of his own invention, are perhaps the most valuable part of his work; they illustrate the situations and the characters of nations and individuals as no other method could have done. His impartiality is proverbial, though perhaps he was unduly severe towards Cleon. The only defect is that he has omitted to describe—no doubt as familiar to his readers—the background of the historical events, the social life of the time, its economical questions, its literature and thought. His style has been censured for its difficulty, indeed for its lack of grammar; but this difficulty has been exaggerated. The speeches certainly are at times obscure, but the narrative is clear and vivid. The genuineness of the last, the eighth, book has been suspected, chiefly owing to the absence of speeches from it; but that is probably due to its unfinished condition. There is no real reason to doubt its authenticity. The *Hellenica* of Xenophon were written to continue Thucydides's history. Editions: Text, with notes—Poppo-Stahl (1875–89), Classen-Steup (1882–92), H. S. Jones (in Oxford Texts, 1900–1); separate books—i. and ii. (Shilleto, 1880), i. (Forbes, 1895), iv. (Rutherford, 1889), v. (Graves, 1884), vi. and vii. (Marchant, 1897 and 1893), viii. (Tucker, 1892); Eng. trans. by Jowett (2nd ed. 1900). See also Steup's *Studien* (1881), Müller-Strübing's *Thukydideische Forschungen* (1881).

Thucydides, the son of Melesias, so called to distinguish him from the historian, was the leader of the aristocratic party at Athens, in opposition to Pericles, after the death of Cimon, from about 450 to 442 B.C. He was a statesman of upright character and considerable ability. But Pericles was too powerful for him, and in 442 B.C. secured his ostracism.

Thugs, a secret fraternity of murderers and dacoits or robbers in India, which was practically suppressed by the British government in 1830. Thugi was a hereditary calling among both Hindus and Mohammedans, who found in Kali (the wife of Siva), the goddess of blood, a common object of worship. Members of the 'brotherhood' recognized one another by a freemasonry of signs and expressions. Thugs insinuated themselves with travellers until an opportunity occurred of strangling or poisoning them and spoiling their goods. Women, poets, low castes, and holy men of every faith were exempt from destruction. See Hutton's *Thugs and Dacoits* (1857), and Meadows-Taylor's *Confessions of a Thug* (ed. 1879).

Thuja. See THUYA.

Thule, the name (*Ultima Thule*) given by ancient Greek and Roman writers to the northernmost island known to them in the northern ocean. It was first discovered by Pytheas of Massilia (c. 330 B.C.); as he only reached it after a six days' voyage from the Orkneys, it is generally held that it was Iceland. But Ptolemy seems to identify it with Mainland, the largest of the Shetlands, some modern authorities with Norway or with Denmark. By ancient writers generally Thule is used in a vague way to denote the extreme north.

Thumbscrew, or THUMBKINS, an instrument of torture, compressing the thumb or thumbs so as to cause agony. It was used by the Spanish Inquisition and in the persecutions of the Scottish Covenanters. The last to suffer by it in Great Britain was the Rev. William Carstairs, a Presbyterian minister, at the hands of the Scottish Privy Council.

Thun, *tn.*, beautifully situated in the Swiss canton of Bern, close to the point at which the Aar issues from the lake of Thun (18½ sq. m. in area; 11½ m. long). It is 19 m. by rail S.E. of Bern, and has pottery factories. Pop. (1900) 6,069.

Thunder. See LIGHTNING, THUNDERSTORM.

Thunderstorm. Thunder is the sound which accompanies the sudden expansion of the air brought about by the heating effects of the electrical discharge and the rapid rush of air along the track where rarefaction has taken place. By taking note of the time that elapses between the lightning flash (see LIGHTNING) and the thunder peal, the distance of the origin can be ascertained, as sound travels at the rate of 1,118 ft. per second. Heat thunderstorms are most common in the afternoon hours, from two to four o'clock, but cyclonic or

winter thunderstorms frequently take place during the night; indeed, over the North Atlantic Ocean, in middle and high latitudes, the nocturnal maximum is well marked. Heat or summer thunderstorms are associated with sudden alterations in air temperature, and usually occur in large, ill-defined areas of low pressure. For the scientific study of thunderstorm phenomena an ingenious instrument called the brontometer has been invented. Thunderstorms are believed to be small atmospheric whirls less than a mile high, and from one to ten miles or more in diameter. The south of England is peculiarly liable to severe thunderstorms in summer.

See Davis's *Elementary Meteorology* (1894), pp. 248-269; Snow Harris on 'Thunderstorms' (1843), in *Quar. Jour. Roy. Met. Soc.*, vol. ii. p. 431; *ibid.* vol. xv. p. 219; xvi. p. 1; Mossman's 'Thunderstorms at the Ben Nevis Observatory,' in *Jour. Scot. Met. Soc.*, vol. ix. pp. 33-38; and Flammarion's *Thunder and Lightning* (1905).

Thuret, GUSTAVE ADOLPHE (1817-75), French botanist, born in Paris. After travelling in Syria and Egypt, he retired to Rentilly (1851). His great discoveries are in the department of algae, and particularly with regard to sexual fecundation in seaweeds. He established a botanic garden at Antibes on the Mediterranean. His chief works are *Fecundation of Fucaceæ* (1853-5); *Sexual Reproduction in Florideæ* (1867), with Bornet; *Notes Algologiques* (1876-80); and *Études Phycologiques* (1878).

Thurgau, Swiss canton, admitted into the Confederation in 1803; is one of the most fertile regions of Switzerland (corn, fruit, etc.). Area, 388 sq. m.; pop. (1900) 113,480, mainly German-speaking and two-thirds Protestants. Capital, Frauenfeld.

Thurifer, the incense-bearer at mass, vespers, etc., in the Roman Catholic Church. The office belongs to the acolyte, one of the minor orders in the Latin Church.

Thurii, an ancient Greek colony in S. Italy, on the Tarentine gulf. It was founded in 443 B.C., near the site of ancient Sybaris, by colonists from all parts of Greece. In 390 B.C. a severe defeat by the Lucanians weakened it greatly, and the same enemies hindered its development until it became allied with Rome. In 194 B.C. it was made a Roman colony. It disappeared during the middle ages. The ancient coins of Thurii are very fine.

Thuringia (Ger. *Thüringen*), a region of Central Germany between the Harz Mts., the Werra, and the Saale. The Thüringerwald, a forest-clad range of hills

(70 m. long), intersects it from N.W. to S.E. The Thuringian states include Saxe-Altenburg, Saxe-Coburg-Gotha, Saxe-Meiningen, Saxe-Weimar-Eisenach, Schwarzburg-Rudolstadt, Schwarzburg-Sondershausen, Reuss (elder and younger branches), and portions of Prussia, Saxony, and Bavaria.

Thurles, mrkt. tn., Co. Tipperary, Ireland, on the Suir, 10 m. N.E. of Cashel. Remains of castle of Knights Templars. Pop. (1901) 4,411.

Thurlow, EDWARD, FIRST BARON (1731-1806), lord chancellor of England; born at Bracon Ash, Norfolk. In 1754 he was called to the bar, and made some reputation by conducting famous cases—e.g. that deciding the succession to the Douglas estates. Thurlow was made solicitor-general in 1770, lord chancellor in 1778. He held the great seal during the ministries of North, Rockingham, and Pitt, but was forced by the last to retire in 1792.

Thurman, ALLEN GRANBERY (1813-95), American politician and judge, born at Lynchburg, Virginia; was called in 1837 to the Ohio judicial bench. He was one term in Congress (1845-7) as a Democrat, but served in the Senate from 1869-81, where he was chairman of the judiciary committee. The Thurman Act, regulating bond-aided railways, is due to him.

Thurn, HEINRICH MATTHIAS, COUNT VON (1580-1640), Bohemian Protestant leader. In 1618 he raised the standard of revolt against the emperor, and invaded Austria, but fled after the disastrous battle of the White Hill at Prague (1620). Later he served in the Swedish army, being present at Breitenfeld (1631) and Lützen (1632). He was finally defeated by Wallenstein at Steinau on the Oder (1633). See *Life* in German by Hallwich (1883).

Thurn and Taxis, PRINCES OF, a noble house, with vast estates in Austria, Germany, and Belgium. One of the princes initiated (letter) posts in Tyrol (1460), another (Franz) that between Brussels and Vienna (1516), while a third (Leonhard) became (1595) grand postmaster of the Holy Roman empire. Only within the last forty years have their postal privileges been withdrawn or compounded. The family originally was descended from the Della Torre of Milan.

Thurot, FRANÇOIS (1726-60), French sailor, born at Nuits, in Côte d'Or; at the beginning of the Seven Years' war wrought much havoc on English shipping in the North Sea, made many prizes in the Channel (1757), and alarmed the coasts of Scotland and Ireland. In October 1760

he captured Carriekfergus; but Hawke's fleet coming up, he joined battle, and fell mortally wounded.

Thursday Island, small island of Prince of Wales group, Torres Strait, Queensland, Australia, 30 m. N.W. of Cape York; is the seat of pearl-shell and *bêche-de-mer* fisheries. Port Kennedy is a government coaling station and a place of call for mail steamers. It is the centre of the episcopal see of Carpentaria. Pop. of island 1,431.

Thurso, seapt., pol. bur. and bur. of barony, Caithness-shire, Scotland, 21 m. by rail N.W. of Wick; exports paving-stones and grain, and has bathing. The new town lies S.W. of the old. The town hall has a library and a museum, the last containing the collection of fossils, etc., left by Robert Dick (1811-66). The ruined church of St. Peter dates from the 14th century. A new harbour has recently been constructed. There is a good pier at Scrabster, on the western side of the bay. Pop. (1901) 3,723.

Thurstan (d. 1140), archbishop of York, was a clerk in the household of William Rufus, and became secretary to Henry I., who nominated him archbishop of York in 1114. He was a founder of religious houses, and roused the north of England against the Scottish invaders under David I., which ended in their rout at the battle of the Standard (1138).

Thurston, SIR JOHN BATES (1836-97), British colonial administrator, born in London, and became a sheep farmer in Australia. In 1864 he joined a botanizing expedition to the South Sea Islands, and was wrecked on Samoa. In 1869 he became consul at Fiji, and having been appointed chief secretary to the native king, was instrumental in having the islands handed over to Great Britain (1874). He became colonial secretary of the new colony, and governor in 1887, and high commissioner of the Western Pacific in the same year.

Thurtell, JOHN (1794-1824), English murderer, was born at Norwich, and settled in London. He accused a Mr. Weare of cheating, enticed the victim to make a journey into the country, and murdered him *en route*. He made a strong defence at the trial, and it was in the evidence led that the famous phrase, 'he drove a gig' (hence Carlyle's 'gigmanity') was used.

Thuya, or THUJA, a genus of hardy evergreen trees belonging to the order Coniferae. They bear monœcious flowers, the male flowers being solitary, and the female in ovoid catkins. The cones are small, and of the same

form as the catkins. The chief species are the N. American arbor vitae, or white cedar; *T. occidentalis*, a very bushy tree with small, yellowish-green leaves; *T. gigantea*, also a native of N. America, a graceful tree with spreading branches; and the Japanese *T. Standishi*, whose leaves are glaucous white below.

Thwaites, GEORGE HENRY KENDRICK (1811-82), English botanist and entomologist, was born in Bristol; was lecturer on botany in Bristol (1846), and in 1849 was appointed superintendent of botanical gardens in Ceylon, where he spent the remainder of his life. His only independent treatise (1858) was *Enumeratio Plantarum Zeylanicæ*. He established cinchona cultivation in Ceylon, and correctly diagnosed the character of the coffee plant disease which revolutionized industry in Ceylon.

T.H.W.M., Trinity high-water mark.

Thyatira. See AK-HISSAR.

Thyestes. See ATREUS and ÆGISTHUS.

Thyidae. See BACCHE.

Thylacine, or TASMANIAN WOLF (*Thylacinus cynocephalus*), a carnivorous marsupial belonging to the same family as the dasyures, and which inhabits Tasmania, but has been greatly reduced in numbers by the settlers on account of its attacks on sheep. It bears a remarkable external resemblance to the Eutherian wolf, with which it has, of course, no connection. The chief external differences from the wolf are the stripes on the posterior part of the body, the tapering and thinly-haired tail, and the short and close fur.



Wild Thyme.

1, Calyx; 2, corolla; 3, leaf.

Thyme. The two species of thyme growing in gardens are the common thyme (*Thymus vulgaris*) and the lemon thyme (*T. Serpyllum vulgaris*). Both are largely used in cookery by reason of their aromatic properties. They are of easy culture, liking a light dry soil and a sunny situation. They may be

readily propagated either by root division or by seed sown in spring. The wild thyme so common on sandhills and downs is *Thymus Serpyllum*, of which the lemon thyme is a variety.

Thymelacæa, a natural order of trees and shrubs, or occasionally herbaceous plants, with usually heads or short racemes of regular flowers, followed by nuts, berries, or drupes. Among the genera are Thymelæa, Daphne, Pimelea, and Lagetha.

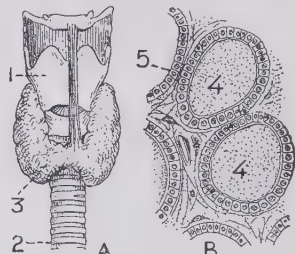
Thymol is methyl-propylphenol, $C_6H_3(CH_3)(C_3H_7)(OH)$, the combining groups being in the 1, 4, 3 positions. It occurs in oil of thyme, can be prepared synthetically, and is a crystalline solid (m.p. $44^\circ C$, b.p. $230^\circ C$) that smells of thyme and is almost insoluble in water. It is a powerful antiseptic, and is used in surgery and for destruction of parasites.

Thymus, a ductless gland, which attains its full size at the end of the second year of extra-uterine life, after which it dwindles until at puberty it has almost disappeared. It lies partly in the neck below the thyroid, and while active produces white blood corpuscles. In reptiles and amphibians, which have no other lymph glands, the thymus persists through life as a white corpuscle producer. The gland, however, may have an internal secretion, exercising some influence upon growth.

Thyroid Gland is one of the ductless glands. It consists of two lobes, which lie one on either side of the upper part of the trachea and lower part of the larynx, and are connected across the front of the trachea by the isthmus of the thyroid, a band of the same glandular structure. It is larger in females than in males, and is very well supplied with blood. It becomes much swollen in goitre, and in myxœdema and cretinism it is either diseased or absent. The complete removal of it by operation, including the parathyroids, brings on myxœdema, but apparently a large proportion of it can be taken without affecting the general health. The exact manner in which it affects metabolism is not yet known, but it modifies the deposit of mucin in the tissues, and so increases tissue waste as to reduce fat. One theory is that its action is not directly chemical on body tissues, but that it is so through its effect upon nerve-centres. The question is how its secretion reaches the tissues, there being no duct.

Until recent years no cure was known for cretinism and myxœdema. Now, in favourable cases, through the administration of a preparation of this gland, complete cure or great general improvement may be expected.

Obesity is much lessened by carefully regulated thyroid administration, though it will soon return when the treatment is stopped, unless exercise and diet are attended to. In some skin diseases, notably psoriasis, lupus, and scleroderma, reports of this treatment are very encouraging, while in regard to other skin troubles reports differ considerably. For true goitre the reports are favourable, but not generally for exophthalmic goitre, though one cure is reported



Thyroid Gland.

A. The gland in position. B. Microscopical section of a portion. 1, Larynx; 2, trachea; 3, thyroid gland; 4, vesicles filled with colloid; 5, epithelium cells.

(*Arch. Ped.*, vol. xiv., No. 12, 1897). There is also a belief that it greatly assists growth generally, increasing bony development in children, and that it may prove useful in rickets. It has been recommended in cases of slow union of fractures. It seems to improve the condition of certain types of insanity—e.g. melancholia. It decreases body weight, apparently by destruction of the nitrogenous tissues, and the carbohydrates of the body, the output of water, carbon dioxide, and urea being greatly increased. In overdoses it produces hyperthyroidism or thyroidism.

Thyroidism, the name given to those symptoms which follow overdoses of the thyroid gland. These are increased rapidity of the pulse, rise of temperature, nervous irritability, and loss of weight, followed by headache, nausea, vomiting, palpitation, and threatened heart-failure.

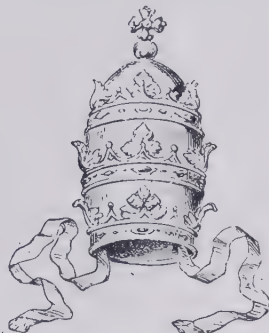
Thysrus, a wand carried by Dionysus and his followers in Bacchic revels. It consisted of a staff terminated by a fir-cone, or by a bunch of grapes, with vine-leaves enveloping part of it.

Thysanura, a sub-order of insects of the order Aptera. The abdomen has ten segments, and the insects have not the power of leaping possessed by their allies, the spring-tails or Collembola. The extremity of the abdomen bears styles, which are often long and hairy, and give the insects their name of bristle-tails. Ex-

amples are *Campodea staphylinus*, a small and delicate creature, found abundantly in the south of England in the open; and *Lepisma saccharina*, the 'silver-fish,' commonly found in drawers containing sugar or farinaceous substances.

Tian-Shan, THIAN-SHAN, or CELESTIAL MTS., a mountain system of Central Asia separating the Tarim (Kashgaria) from the Issik-kul and Ili (Balkhash) basin, and extending E. as far as 92° E. long. The extreme eastern section of the Tian-Shan has been termed by Russian explorers the Nameless Range. This section, going west, is followed by the Bogdo-ola; and this again by the Doss-megen-ora chain, reaching almost 20,000 ft. From the Doss-megen-ora section the Tian-Shan expands, as it continues westward, into a number of lateral ridges, the main section running s.w. to near Issik-kul. Here we

temporal claims, as the keys are the symbol of his spiritual au-



Tiara, or Triple Crown.

thority. The tiara is formed of gold cloth, encircled by three crowns, and surmounted by a

the Tiber's confluence with its principal tributary, the Nera. The old Tiber is the southern branch; on it stood the ancient fort of Ostia, now sand-blocked, and distant 5 m. from the sea. There is a project to cut a ship canal, 33 ft. deep, through Ostia to Rome. But the 'yellow river' is as liable to floods now as ever it was. Between 1876 and 1900 the authorities of Rome and the kingdom spent £5,000,000 in straightening and embanking the river in the city of Rome. The Chiana Canal joins the Tiber to the Arno.

Tiberias, the chief town of Galilee, in ancient Palestine, was situated on the south-western shore of the Lake of Gennesaret. It was founded by Herod Antipas in honour of the emperor Tiberius, and was famous for an academy of learned Jews. Its modern name is Tabarieh.

Tiberius (42 B.C.-37 A.D.), second emperor of ancient Rome,



Tiberias.

have the Muzart Pass and Khan-Tengri (23,950 ft.). Almost due west the system throws out (to the N. of Issik-kul) the Trans-Ili Ala-tau, Kungei Ala-tau, and Alexander Mts., and is continued, at much lower levels, into the plains of the Jaxartes or Syr Daria, by the Talas-tau and Kara-tau, almost to 67° E. long. On the other side (the S. and S.E.) of Issik-kul the Tian-Shan runs in several chains (Terskei Ala-tau, Kok-shal-tau, Terek-tau) s.w. to the Alai, Trans-Alai, and Peter I. Mts., to the highlands of E. Bokhara, and so on to the sources of the Zerafshan. In the Pamir plateau it connects with the great Tibetan and Indian ranges.

Tiara, the pope's crown, which, in its triple form, symbolizes his

golden globe and cross. There was a tradition that Boniface VIII. added the second, while Urban V. assumed the third of the crowns.

Tiber (Lat. *Tiberis*, Ital. *Tevere*), river of Italy, rises among the Apennines on the eastern border of Tuscany. After a rapid course of 260 m.—first s.s.e. and then s.s.w. towards the level Campagna—it debouches into the Tyrrhenian Sea by two branches, between which lies the Sacred I., or Isle of Venus, once celebrated for its roses, but now a dreary swamp. Of the two branches the northern, the Fiumicino, artificially excavated in Roman times, is navigable for river steamers to Rome, and thence there is navigation for small craft (100 m.) to

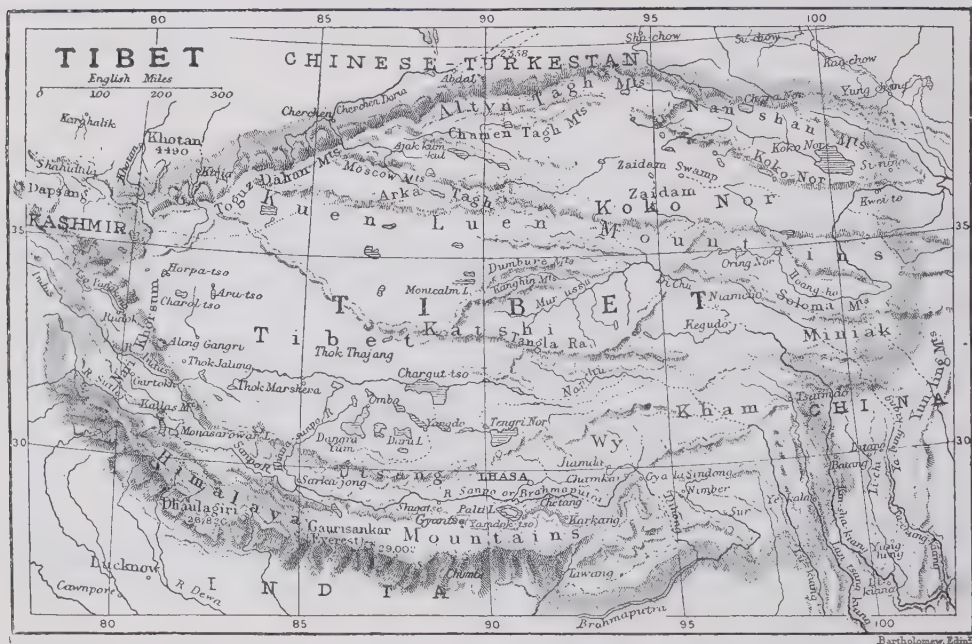
whose full name was Tiberius Claudius Nero. In 38 B.C. his mother, Livia, married Octavian, afterwards the emperor Augustus. In 20 B.C. Augustus sent him to restore Tigranes to the throne of Armenia; in 15 B.C. he and his brother Drusus completed the subjugation of Rhætia and Vindelicia; in 13 B.C. he was made consul, and in 12 B.C. and the following years was occupied in subduing rebellious tribes in Pannonia. In 11 B.C. Augustus caused him to divorce his wife Vipsania Agrippina, daughter of Agrippa, to whom he was devotedly attached, in order that he might marry Augustus's own daughter Julia. In 6 B.C. Tiberius was charged with a special commission to put down a revolt in

Armenia. But Tiberius saw that he was intended to be merely guardian to the future emperors, Gaius and Lucius Cæsar, Julia's sons by her first husband Agrippa. Disappointed in this way, and disgusted by the scandalous conduct of his second wife, he retired into voluntary exile at Rhodes. In 2 B.C. Julia was banished, and in 2 A.D. Tiberius returned to Rome. After the death of Gaius Cæsar in 4 A.D. (Lucius had died two years before) he was adopted by Augustus, along with Agrippa's youngest son, Agrippa Postumus; but the latter soon became insane. In 4 A.D. Tiberius was sent to conduct a campaign in Germany; in 6 A.D. he was on the

the war with Numidia (17-24 A.D.), the rebellion in Gaul (12 A.D.), the suppression of a revolt in Thrace (25 A.D.), and an expedition against Parthia (35 A.D.). In domestic affairs the reign presents a dreary record of conspiracies and consequent executions. The troubles began with the death of Germanicus in 19 A.D. In 29 A.D. Agrippina, wife of Germanicus, and her eldest son, Nero, were banished, and her second son, Drusus, imprisoned; in 31 A.D. Tiberius discovered Sejanus's treachery, and caused him to be condemned to death by the senate; many of his friends were also executed. In 33 A.D. Drusus was starved to death, and

with great ability and generosity. His character has been blackened by Tacitus chiefly, who represents the senatorial opposition to the principate. In particular, the stories of Tiberius's unnatural vice, considering the great age which he attained, must be discredited. See Baring Gould's *Tragedy of the Cæsars* (1892), and Tarver's *Tiberius* (1902).

Tiberius, emperor of Constantinople from 578-582 A.D. His full name was Tiberius Anicius Thrax Flavius Constantinus. He was brought up at Justinian's court. Justinus II. made him Augustus in 574, from which date he really ruled the empire, though he reigned alone only after Jus-



point of subduing Maroboduus, king of Bohemia, when he was called away to put down the Pannonian revolt, a work which was only finished in 9 A.D. In the same year Varus's army was annihilated in Germany; Tiberius had to reorganize the defence of the Rhine, and restore the spirit of the troops (10-13 A.D.). Tiberius's reign falls naturally into two parts, for in 26 A.D. he left Rome, and withdrew first into Campania, and in 27 into the island of Capræa. The first years of his reign were marked by revolts of the Pannonian and Germanic troops, which were soon put down, and by Germanicus's campaigns in Germany, in 14-16 A.D. Other military events were

Agrippina met the same fate of her own free will. But practically all of these victims were legally condemned by the senate. Tiberius was to blame, perhaps, for excessive suspicion, which he showed by encouraging professional informers, and widening the application of the term high treason. Otherwise, he was a good ruler; certainly he lessened the popular power by virtually doing away with the popular assembly, and that of the senate by accepting supreme power for life, not for a limited time, but he tried to give the senate a share of the government. He improved the civil service, kept the army in strict discipline, and managed the finances

tinus died in 578. His reign was chiefly occupied with a war with Chosroës, king of Persia, who was severely defeated in 576, and by Mauricius in 580 and 581.

Tibet, a country of Central Asia, nominally subject to the Chinese empire, comprising in its widest sense the whole region between the Himalaya and Kuen-lun Mts., and between Kashmir and W. China, and containing the most elevated section of the central Asiatic highland and the loftiest plateau land on the surface of the globe. This region, scarcely at any point dropping to less than 11,000 ft. above sea-level, and over a very great portion of its area exceeding 16,000 ft., slopes gradually eastward



Scenes in Tibet.

1. Dehung Monastery, the largest and richest in Tibet, with over 10,000 monks. 2. Stewards and senior lamas, Sera Monastery. 3. Ti Rimp-ehi, of Galdan Monastery, regent for the Chinese emperor, who signed the treaty with the British. 4. Group of lamas, Tatsang. 5. Sera Monastery. (By permission of the Imperial Geographical Society of Russia.)

into China proper; but on the N., S., S.W., and W. it is bordered by some of the highest of the world's mountains. Certain geographers make two main divisions of Tibetan territory—(1) the Chang table-land, comprising all Northern and Central and most of Western Tibet; and (2) South and South-eastern Tibet. The former, characterized by a terrible climate, and uninhabitable for the greater part of the year, mainly consists of a series of parallel mountain ranges running from E. to W., and of the generally miry troughs or valleys between them. In these depressions lie vast numbers of lakes or basins of internal drainage, many of them salt. It is a treeless region, with grassy tracts here and there. The south-eastern region, on the other hand, lying S. of the Tang-la Mts., is somewhat lower in elevation, is traversed by the Brahmaputra and other rivers, enjoys a less repellent climate, and contains most of the population. In this part of the region are found also the upper courses of the Indus, Sutlej, Ganges, Mekong, Salwin, Hwang-ho, and Yang-tsekiang. Import trade is chiefly in silks, gold lace, carpets, gems, tea, porcelain, leathern and cotton goods, sheep, horses, salt, and borax from China, Chinese Turkestan, and Mongolia, and rice, indigo, coral, sugar, spices, and saffron from India and Indo-China. The principal exports are musk, yaks' tails, skins, ponies, wool, salt. The trade with India reaches an annual total of probably £250,000, and the total trade with all countries is probably not more than £700,000. The Tibetans, who are of Mongolic stock, number probably from 1½ to 2 millions. For ages the chief authority rested with the Grand Lama (Dalai Lama) of Lhasa, his sway extending as far north as the Tang-la Mts. But, as a consequence of the British expedition to Tibet in 1904, the power was transferred to the Grand Lama of Tashi-lunpo, near Shigatse. A Chinese resident (*amban*) represents that empire in Tibet, over which China has claimed a suzerainty since the 18th century. See Sven Hedin's *Scientific Results* (1905-6), Chandra Das's *Journey to Lhasa and Central Tibet* (1899), Rockhill's *The Land of the Lamas* (1891), Bower's *Diary of a Journey Across Tibet* (1893), Grenard's *Le Tibet* (1904), Wellby's *Through Unknown Tibet* (1898), Prievalsky's journeys (vide *Proc. Roy. Geog. Soc.*, vols. x. etc.), G. Sandberg's *The Exploration of Tibet* (1904), C. G. Rawling's *The Great Plateau* (1905), Savage Landor's *Tibet and Nepal* (1905), and Crosby's *Tibet and Turkestan* (1905).

Tibetan Terrier, or BHUTEER. Its home was originally in Lhasa, and specimens were smuggled into India by way of Leh and Kashmir. It varies considerably in size, some being as large as a poodle, others as small as a Maltese. It bears a strong resemblance to the Skye terrier, but its tail curls over its back. It carries a beautiful and shaggy coat, the body is compact, the head rather large and round, inclining in this respect to the Tibetan type; the eyes are intelligent, and half hidden with a profuse fringe; the feet and legs are well covered with hair.



Tibetan Terriers.

(By permission of the Hon. Mrs. M'Laren Morrison.)

Tibullus, ALBIUS (54-18 B.C.), elegiac poet of ancient Rome, belonged to a family of Pedum, between Tibur and Præneste. In 31 B.C. he accompanied Messala into Gaul, where the Aquitanians had revolted, and afterwards celebrated his patron's victory. Tibullus next followed Messala as far as Corcyra, but he was taken ill there, and returned to Rome. His poems are mostly on the subject of love, and are marked by unusual depth and sincerity of feeling, while the style is simple and unaffected. Editions: Text—Bährens (1878), Hilfer (1885), Postgate (1906); with notes—Dissen (1835). Selections—Ramsay (1887); English verse translation—Cranstoun (1872).

Tibur. See TIVOLI.

Tic Douloureux. See NEURALGIA.

Tichborne Case, the longest trial recorded in England. Tichborne is an estate in Hampshire. Roger Charles Tichborne, eldest son of James, afterwards tenth baronet, was born 1829. He sailed (1853) to Valparaiso, and next year sailed from Rio de Janeiro, in the *Bella*, which foundered at sea with all hands. The baronetcy and estates passed to his brother, Alfred Joseph Doughty-Tichborne. Alone of the family, Roger's mother, clinging to hope, advertised unguardedly. In these circumstances, a butcher in Australia claimed to be the lost Sir Roger, saved from the wreck of the *Bella*, and as such he was received by the infatuated mother. The claim was opposed on behalf

of a son of Sir Alfred Tichborne. On March 6, 1872, the 103rd day of the trial, the claimant was non-suited. Then, arrested as Orton, on a charge of perjury, he was brought to trial, and on February 28, 1874, the 188th day of the new trial, sentenced to fourteen years' imprisonment. The two trials are estimated to have cost about £200,000, and to have mulcted the estate of over £90,000.

Ticino, or TESSIN, canton and river. The river (Lat. *Ticinus*) rises in the St. Gothard group, and flows into the Lago Maggiore, from the southern end of which it emerges, and falls into the Po a little below Pavia. It quits Swiss territory a few miles after entering the Lago Maggiore. It is famous in history for Hannibal's victory over P. Scipio, gained on its banks in 218 B.C. This river gives its name to the Swiss canton (1,088 sq. m. in area; pop. 138,548, all Italian-speaking and Roman Catholics), which was formed in 1803. It is really 'Italian Switzerland,' and its capital is Bellinzona.

Tickell, THOMAS (1686-1740), English poet, born at Bridekirk, Cumberland. He was a friend of Addison, who, in 1717, gave him the post of under-secretary of state. Tickell subsequently became secretary to the lord-justices in Ireland, and held this office for the remainder of his life. His poems chiefly celebrate the public events of the moment. His most ambitious effort was *Kensington Gardens*; *Colin and Lucy* was admired by his own generation.

Ticket-of-Leave. See PENAL SERVITUDE.

Ticknor, GEORGE (1791-1871), American literary historian, was born at Boston, Massachusetts. During his first sojourn in Europe (1815-19) he began to study literature, especially that of Spain and Portugal. On his return to America he was appointed to the chair of Modern Literature at Harvard, which he held till 1834. From 1835-8 he was again in Europe, but after that mostly at Boston. His *History of Spanish Literature* first appeared in 1849 (6th ed. 1888). As a whole, it is stronger on the scholarly than on the critical side. Of Ticknor's other works the *Life of his friend Prescott* (1864) is alone important. He left his valuable Spanish library to Boston. See monographs by Hillard (1876) and by Hart (1871).

Ticks (Ixodidae) constitute a family of Acarina, and are parasites of terrestrial animals. The body is mite-like; there are four legs, ending in claws, which serve for purposes of attachment to

the host, and the mouth bears a long rostrum or beak furnished with recurved hooks. Ticks cling to the hair, etc., of the host by the legs, and puncture the skin with the beak. In some cases they drop off as soon as they have gorged themselves with blood, while in others they remain more or less permanently attached, but pairing and egg laying take place on the ground. Ticks are capable of living for a prolonged period without food, and are to be found free under stones, and also on trees and herbage. Dogs, sheep, and cattle are all liable to infection by *Ixodes ricinus*; pigeons are usually infested with *Argas reflexus*, a blind form. Other members of this genus attack man; thus *A. persicus*, the 'poisonous bug of Miana,' is greatly dreaded in Persia. The name tick is often applied to the sheep-louse, and also to the death-watch, neither of which belongs to the Acarina. It has been recently shown that the disease known as Texas or Rocky Mountain fever is due to a protozoan parasite (*Piroplasma*) transmitted by ticks.

Ticonderoga, vil., Essex co., New York, U.S.A., is situated on a lofty promontory between Lakes George and Champlain; has wood-pulp and paper factories, and yields graphite. The fort was captured (1775) from the British by Ethan Allen, and in 1777 recaptured by Burgoyne. Pop. (1900) 1,911.

Ticunas, TACUNAS, or JAMANAS, a South American nation, on the Putumayo and Marañon rivers. They are noted for their fine physique, tall, slender figures, and round, regular features, set off by artistic tattoo designs. They prepare poison for the neighbouring wild tribes, although the Ticunas themselves are a gentle, harmless people.

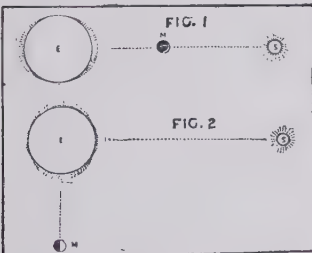


Diagram illustrating the formation of (1) spring tide and (2) neap tide.

Tides. The tide is the rising and falling of the sea, which takes place about twice a day, becoming, however, each day later by from half an hour to an hour. The rising of the sea is called

the flood tide, the falling the ebb tide. The tides do not always rise to the same height, but every fortnight, with the new and the full moon, they rise much higher. These high tides are called spring tides. The alternating tides of maximum lowness are called neap tides. The highest spring tides are those which follow the new moon by one, two, or three days, depending on the locality. When the moon is in perigee, or nearest the earth, the rise and fall are sensibly increased. The

each day vary with the locality. The 'establishment' of a port or place is the time of high water on the days of the new moon and full moon, which is the same; and from this the intermediate times of the tide for other days can be determined. The 'age' of the tide at any place refers to the interval from the time of the new or full moon to the time of the next spring tide. 'Diurnal inequality' is the irregularity in the time of tides brought about in certain localities more than in



Course of the Tidal Wave hour by hour round the British Coasts.

spring tides are greater about the time of the equinoxes—i.e. about the end of March and of September—than at any other time of the year, and at the same times the neap tides are less. The range of the tide at any particular place is the height from low water to high water, and varies according to locality. On the coasts of England it is 47 ft. at the head of the Bristol Channel during an excessive spring tide; in some other parts the range is not more than 4 ft. The times also of high water

others by the fact of the moon being on one side or other of the equator. This inequality amounts sometimes to as much as two hours' difference in the time of high water, and forty minutes in that of low water. At the same time, there is a difference in the range of 12 in. at high and of 36 in. at low water. In tropical waters, and especially in the Indian seas, this diurnal inequality is particularly noticeable, while in home waters it is peculiarly small. The maximum inequality corresponds, but is not

necessarily simultaneous, with the moon's greatest declination; and the period of its vanishing corresponds in like manner with the time of the moon passing the equator. The rule of diurnal inequality depends upon the moon's declination.

Tidal streams should not be confused, as they often are, with the tides themselves. The ebb stream continues running for some time after low water is reached; and, in the same way, the flood stream continues running some time after high water is reached. In the English Channel the east-going stream runs for three or four hours after high water has been reached on the coast; and the eastern stream is still running when the tide is ebbing in-shore. With a flood tide it is *vice versa*, and this characteristic is known to pilots as tide and half-tide.

For making observations and constructing a tide-table a tide-pole is used. This is usually a painted batten marked black and white at six-inch intervals, and lashed to an upright guyed to the ground by stones or shot in a shallow and sheltered place where the sea has free access. It can be read through a telescope from a distance, and the height and times are noted.

Bores.—When the tidal wave is cooped within a narrow estuary or river, it gives rise to a large and rapidly advancing wave or waves termed a bore, which rushes in a boiling flood between the converging shores. The tide rises as a bore of from 6 ft. to 9 ft. in height on the Severn, Seine, Hughli, and other rivers, and is especially evident on the Amazons and the Tsién-tang-kiang, where it is often from 10 to 15 ft. high. See Airy's 'Tides and Waves' (in *Encyc. Met.*), Lamb's *Hydrodynamics* (1895), Baird's *Manual of Tidal Observation* (1887), Hatt's *Phénomène des Marées* (1885), Burdwood's *Directions for Reducing Tidal Observations* (1876), and Wheeler's *Practical Manual of Tides and Waves* (1906).

Tidesman, or TIDEWAITER, an obsolete custom-house official, who attended ships to prevent breaches of the revenue laws.

Tideswell, tn., Derbyshire, England, 6½ m. E.N.E. of Buxton; has ancient church of St. John the Baptist. Pop. (1901) 1,985.

Tieck, JOHANN LUDWIG (1773-1853), German author, was born at Berlin, and became one of the leaders of the romantic movement, especially during his stay at Jena in 1799 and 1800. After spending some time with Friedrich von Schlegel at Dresden, he travelled to Italy in 1804. He lived at Dresden from 1818 to

1841, when he received a call to Berlin; there he remained until his death. The best known of his many novels and short stories are *William Lovell* (1795), *Fran Sternbalds Wanderungen* (1798); of his plays, the tragedy *Leben und Tod der heiligen Genoveva* (1800) and the comedy *Kaiser Octavian* (1804). He did excellent work as a translator—*Don Quixote* (1799–1801); and, with A. W. von Schlegel, *Shakespeare* (1826). Tieck also edited numerous monuments of older German literature. Tieck's *Gesammelte Werke* (20 vols.) appeared in 1826–46. There is a convenient selection in 2 vols., by Minor, in *Kürschners Nationalbibliothek*. His *Life* has been written, in German, by Friesen (1871). See also Carlyle's *Miscellaneous Essays*, vol. i. Some fairy tales and novels were translated by Carlyle and Thirlwall.

lions sterling annually, imports greatly predominating. Skins, wools, groundnuts, coal, and gold are the chief exports. The treaty of 1858; the occupation by the allies in the winter of 1860-1; the massacre of Roman Catholics and other foreigners, June 21, 1870; the bombardment of foreign settlements, June 17 to July 14, 1900; the capture of the city by the allied forces, July 15, 1900; and the administration of Tientsin by foreign provisional government until Aug. 15, 1902, are the most notable events of recent years. Pop. 750,000.

Tièpolo, GIOVANNI BATTISTA (1696-1769), Italian painter, born in Venice. A disciple of Paolo Veronese, he was chiefly engaged in decorative work and in the painting of altar-pieces—e.g. frescoes in the Palazzo Labia at Venice. He also executed frescoes for various palaces in Spain.



Tierra del Fuego.

Tiel, tn., Netherlands, prov. Gelderland, on the r. bk. of the Waal, 25 m. by rail w. of Nijmegen. Pop. (1901) 10,788.

Mele, CORNELIS PETRUS (1830-1902), Dutch theologian, was born at Leyden, and after pastorates at Moordrecht (1853) and Rotterdam (1856), became principal of the Remonstrant Seminary (1873), and professor in the university of his native town (1877-1901). He is the author of *Comparative History of the Religions of Egypt and Mesopotamia* (Eng. trans. 1878-82), *Babylonisch-Assyrische Geschichte* (1885-7), *Outlines of the History of Religion* (Eng. trans. 1877), *Geschichte der Religion im Alterthum* (1895-6), *Gifford Lectures* (1897-9) on the *Elements of the Science of Religion*.

Tientsin, city, prov. Chi-li. China, on r. bk. of Pei-ho, at its junction with Grand Canal, and 80 m. s.e. of Pekin. It is the port of supply for the whole of China n. of the Yellow R. The total trade exceeds eleven mil-

such as *The Glory of Spain*, in the Royal Palace, Madrid.

Tierra del Fuego, isl. at southern extremity of S. America. The northern part is comparatively low, and thence there is a gradual ascent to the mountains which extend to the Beagle Channel on the southern coast, and which culminate in Mt. Sarmiento, 7,200, ft. The western coast is much indented. Sheep-farming has of late years made great progress, and on the Beagle Channel a small quantity of gold is collected. East of the mountains live the Ona Indians; on the Beagle Channel the Yaghans. The island is divided between Argentina (E.) and Chile (W.). The capital of the Argentine territory is Ushuaia. The whole island contains about 20,000 sq. m., of which 8,038 belong to Argentina, with a population of 500 whites. See Sir M. Conway's *Acomcagua and Tierra del Fuego* (1902).

Tietjens, TERESA. See TITIENS.

Tiffin, city, Ohio, U.S.A., co. seat of Seneca co., on Sandusky R., 45 m. S.S.E. of Toledo. Here is Heidelberg College. Pop. (1900) 10,989.

Tiflis. (1.) Government in Transcaucasia, Russia. It includes, on the N., some of the loftiest peaks of the Caucasian range—Kazbek, Tebulos, and Borbalo—while the southern part is occupied by ranges of the Minor Caucasus. Forest grows in the mountain valleys, covering about a quarter of the surface. Georgians and Armenians form the bulk of the inhabitants. The principal occupations are agriculture in the lowlands and grazing on the mountain slopes. Silk and good wine are produced in Kakhetia. Copper ore is worked;

dral. Tiflis is a commercial centre, exporting silk, carpets, cotton, tobacco, and silver ornaments in filigree and enamel work. Pop. (1897) 160,645.

Tigellinus, SOPHONIUS, a native of Agrigentum in Sicily, who in 63 A.D. was appointed joint prefect of the prætorian guard at Rome by Nero. He promoted the emperor's divorce from Octavia and his marriage with Poppæa, and was active in suppressing the conspiracy of Piso. He accompanied Nero to Greece. On the fall of Nero he secured the protection of Galba, but on Otho's accession was compelled to commit suicide.

Tiger (*Felis tigris*), a large carnivore, closely related to the lion, to which it is little inferior

mal, the tiger is especially found in forest regions or in grass plains. It is very intolerant of extreme heat, and is usually found near water. In India it is usually solitary, and certainly monogamous. From two to five cubs are produced at a birth, and breeding only takes place once in two or three years. In captivity the tiger breeds much less frequently than the lion, and the cubs are difficult to rear. When caught young, the tiger is capable of being tamed to some extent.

In India the natural food of the tiger consists of deer, wild pigs, antelopes, domestic cattle, monkeys, and smaller animals. Tigers will eat carrion, and usually leave their own 'kill' until it is partially decomposed. In



Bengal Tiger.

[Photo by Dizon.]

Glauber's salt and petroleum are extracted. Area, 16,847 sq. m. Pop. (1897) 1,040,943. (2.) Chief town of above gov. It consisted previously to 455 A.D. of only a few houses grouped around the hot springs from which it derived its name. In that year the Georgian ruler transferred his capital from Mtskheta to this town. It is on the Kura, and consists of a modern Russian town, an old dirty and confined Persian quarter overlooked by a ruined Georgian fortress, and a German colony founded in 1818 by religious refugees from Württemberg. The palace of the governor-general of the Caucasus, the museum, and the botanical gardens are in the new Russian town. On the other side of the river, near the citadel, is the Georgian cathedra.

in strength. The general ground colour is rufous brown, the under parts being white; head, body, and limbs are transversely striped with black, with which colour the tail is also ringed. The stripes in young animals are very conspicuous, but the intensity of the tints fades with age. The males exceed the females in size, and measure from 5½ to 6½ ft. in length from the tip of the nose to the root of the tail, the tail being about 3 ft. long. The height at the shoulder varies from 3 to 3½ ft. The tiger is widely distributed throughout Asia, being specially abundant in India, though absent from Ceylon, as it is also from the plateau of Tibet. Fossil, it is found with the mammoth within the limits of the Arctic circle. Typically a jungle ani-

mal, many parts of India 'man-eating' tigers occur. Usually, but not invariably, such tigers are females; they may be females with cubs, or animals partially incapacitated by old age or by wounds. It appears to be a well-established fact that once a tiger has taken to man-eating, it confines itself afterwards to this kind of food. In many parts of India the death-roll from this cause is still very large.

Tiger-beetle, a general name for the members of the family Cicindelidæ, which are very active carnivorous beetles, with burrowing larvæ. Four species are British, the common green tiger-beetle being *Cicindela campestris*.

Tiger-flower. See TIGRIDIA.
Tiger-lily. See LILY.

Tight Lacing. While producing distortion and displacement of many organs, tight lacing is harmful chiefly from its pernicious compression of the thoracic viscera. The mobility of the lower ribs is diminished or abolished, and full inspiration becomes an impossibility. Such interference with the function of respiration hinders the proper oxygenation of the blood, and results in malnutrition, not only of the lungs, but of all the tissues and organs of the body. Increased pressure on the heart and on the abdominal blood-vessels has equally disastrous effects upon the circulation, and venous engorgement leads to sluggish and inefficient action of the abdominal viscera. The tissues then fall a ready prey to such diseases as tubercle; while, for want of free movement and exercise, the trunk muscles atrophy, so that hernias through the weakened abdominal walls frequently occur. By increasing the intra-abdominal pressure, tight lacing also produces or aggravates many displacements of the pelvic organs, and not uncommonly leads to miscarriage.

Tiglath-pileser, three Assyrian kings. **TIGLATH-PILESER I.**, who reigned from about 1120-1105 B.C., became a great Oriental conqueror. His conquests lay largely in the north of Mesopotamia and in Syria, and included the capture of Babylon and Sippar.—**TIGLATH-PILESER II.** (c. 950-930) was contemporary with Solomon.—**TIGLATH-PILESER III.**, who reigned from 745-727 B.C., was one of the greatest of Assyrian conquerors. His proper name was Pul (2 Kings 15:19). During his reign not only was Babylonia definitely subdued, but he reconquered Armenia, also Syria, Media, Chaldaea, Damascus, Judaea, and Gaza. He was the first to transport the inhabitants of one part of his empire to another and repopulate the deserted tracts with strangers.

Tigranes, the name of several kings of ancient Armenia; in its native form the name is Dikran. **TIGRANES I.** (middle 6th century B.C.) was a companion of Cyrus, king of Persia, and is reputed to have overthrown the Median empire. Later he was made the popular hero of Armenia.—**TIGRANES II.** (90-55 B.C.) invaded Parthia, and in 83 B.C. conquered Syria. At this time he founded Tigranocerta in Armenia. In 76 he allied with Mithridates against the Romans; and his reception of Mithridates, when a fugitive, brought Lucullus upon him. He was twice defeated by Lucullus—in 69 and 68—and in 66 B.C. submitted to Pompey, who left him

in possession of Armenia proper, though he had to pay an indemnity of 6,000 talents. After this date he was again at war with Parthia, but without definite result.—**TIGRANES III.**, grandson of the above, was in exile at Rome when, in 20 B.C., he was placed on the throne of Armenia by Augustus; but his reign was brief.

Tigré, N. div. of Abyssinia; also the Semitic race who inhabit the region.

Tigre, a country resort of Buenos Ayres, Argentina, 18 m. up the Paraná by rail.

Tigres, or GREAT FISH BAY, an inlet 20 m. long in the extreme S. of Portuguese W. Africa.

Tigridia, a genus of Mexican and tropical American bulbous plants belonging to the order Iridaceae. They bear spathes of flowers. They are easily grown in sandy soil in a cool greenhouse, or they may be planted out in a sheltered position in the spring. The garden tiger-flowers are mostly varieties of *T. pavonia*, an orange-flowered species.

Tigris, riv., Asiatic Turkey, originates in two head-streams—the Shat, or W.; and the Bitlis or Bohtan-su, or E. The former rises in the N.W. of the vilayet of Diarbekir, and flows E. and S.E. to Til, where it is joined by the latter, which comes W. from the south of Van. The united stream flows S.S.E. past Mosul, Samara, and Bagdad to join the Euphrates at Kurna, 40 m. N.W. of Basra (Bussorah). After that the Tigris-Euphrates is known as the Shat-el-Arab. The total course is some 1,150 m. The chief tributaries are the Great Zab, the Little Zab, and the Diala. Steamers can reach Bagdad, sailing craft Samara. Beside it lie the sites of the ancient cities of Nineveh, Nimrud, Seleucia, and Ctesiphon.

Tikhvin, tn., Novgorod gov., Central Russia, 106 m. N.E. of (old) Novgorod city; is a river port, with mills and distilleries. Tikhvin grew up, in and after 1383, around a convent with a miraculous icon, an object of pilgrimage. Pop. (1897) 6,631.

Tilburg, tn., prov. N. Brabant, Netherlands, 43 m. by rail S.E. of Rotterdam, with manufacture of woollens, cloth, and leather. Pop. (1900) 40,628.

Tilbury Fort, Essex, England, on Thames, opposite Gravesend. It was built by Henry VIII. and enlarged by Charles II., and is now strongly fortified. Here, in 1588, Queen Elizabeth is said to have reviewed her troops preparing to repel the Spanish invasion.

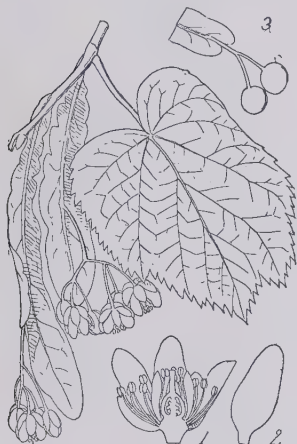
Tilden, SAMUEL JONES (1814-86), American statesman, born at New Lebanon, New York state. In 1868 he was leader of the Democrats of that state, and was the means of overthrowing Tweed

and Tammany. In 1874 he was governor of New York, and in 1876 was nominated as Democratic candidate for the presidency. He bequeathed a large sum of money to found and endow a free library in New York. His *Speeches* are edited by J. Bigelow (1885).

Tile, a thin slab of baked clay variously shaped and coloured; used for roofing, walling, paving, draining, internal lining, or external ornament. Common flat tiles are cut by machinery at the rate of 500 per hour. In the case of flat encaustic tiles the bodies are stamped on the top with a pattern, the depressions of which are filled with different coloured clays, fixed by firing. Black tiles are tarred; others are lusted or enamelled, or are made of majolica, terra cotta, laminiferous stone, and even of wood (shingles). By Prosser's process (1840) mixed clay is prepared, dried, powdered, moulded between two steel dies, under a pressure of from 300 to 400 tons, till hard and dense as stone, and is then used chiefly as *tessera*, or cubes, for mosaic work. Roman roofing tiles, semi-cylindrical, were used for covering the raised ridges of flat slabs; known also to the Assyrians, Chinese, and Greeks, and still employed in Italy. Developments of these are the round (12th century) and rib (15th century) tiles, like an elongated S. Flat wall tiles, originating in Champagne and Burgundy (13th century), developed into scale and striated tiles. In 1851 Gilardoni invented the lozenge, Marseillaise, and Boulet varieties. In 1882, in Switzerland, a tile akin to this—the mountain tile—was introduced by Schmidkerez. Inlaid tiles, decorated with incrustations of powder, appeared in 1861. A specimen from the Persian palace of Susa, dating from the reigns of Darius (521-485 B.C.) and Artaxerxes Mnemon (409-358 B.C.), exists in the Louvre; and the Arabs and Moors produced beautiful tiles, and introduced them into Europe. The mosques at Damascus, Cairo, and Granada were adorned with lusted tiles, and the majolica *azulejos* of the Alhambra are renowned. White marble tiles, first made at Naxos in 620 B.C. (see Pausanias, v. 10, 2), adorned the roofs of Greek and Roman temples. Gilded bronze tiles (Pliny's *Hist. Nat.* xxxiv. 7) shone on the Temple of Vesta; and those from the Temple of Jupiter Capitolinus, transferred to St. Peter's basilica by Pope Honorius I. (625-638), were stolen by the Saracens (846). Beautiful majolica pavements exist at Rome (the church of S. Maria del Popolo), Florence (tomb of Federighi), Bologna (S.

Petronio), Siena (St. Catherine). Glazing was rediscovered by Palissy (1553), and Wedgwood further developed decorative tiling. The rectangular burnt clay tile in common use is perhaps best made at Brosely (Shropshire). See Emile Bourry's *Ceramic Industries*, trans. by W. P. Rix (1901); Leon Lefèvre's *Architectural Pottery*, trans. by K. A. Bird and W. M. Binns (1900); Owen Carter's *Practical Designing* (1893); Wallis's *Persian Ceramic Art*, in Godman Collection (1891); *Treatise on Manufactures*, by Davis (1889) and by Dobson (1886); and H. J. Snell's *Enamel-painting on Tiles*.

Tilhar, munic. tn., Shahjahanpur dist., United Provinces, India, 12 m. W. of Shahjahanpur; has trade in unrefined sugar (*gur*). Pop. (1901) 19,091.



Tilia, or Lime Tree.

1. Flower, section; 2. petal; 3. fruit.

Tilia, a genus of hardy trees belonging to the order Tiliaceæ. They bear cymes of whitish or yellowish flowers, which secrete a quantity of honey, and the flowers are followed by nutlike, globose fruits. See also LIME.

Tiliaceæ, a natural order of plants, of which the limes and *Corchorus capsularis*, the source of jute, are the most important species. Among the genera are *Tilia*, *Aristotelia*, *Corchorus*, and *Triumfetta*.

Till. See BOULDER CLAY.

Tillandsia, a genus of tropical American herbaceous plants, mostly epiphytal in habit, and possessing considerable beauty. They bear narrow, entire leaves, and terminal spikes of flowers, with free sepals and petals. Most of the species are worth cultivating in the stovehouse, a rich, somewhat heavy loam, containing peat and leaf mould, being required.

Tillemont, LOUIS SÉBASTIEN LE NAIN DE (1637-98), French ecclesiastical historian, born at Paris, educated at Port-Royal, and became a priest through the influence of his friend Le Maître de Sacy. He took up the study of church history; but to avoid the censor, issued his work separately as the *Histoire des Empereurs* (1690-1701) and *Mémoires pour servir à l'Histoire Ecclésiastique des Six Premiers Siècles* (1693-1703; Eng. trans. 1733), both covering much the same period. He also wrote a *Vie de Saint-Louis*, not published till 1847.

Tillicoultry, pol. bur., Clackmannanshire, Scotland, at the S. base of the Ochils, 4 m. N.N.E. of Alloa; has manufactures of tartans, tweeds, shirtings, shawls. Its blankets and serges were long famous. Coal is mined. Pop. (1901) 3,337.

Tillodont, a fossil mammal belonging to the Eocene period in Europe and N. America. In many features the Tillodontia resemble the living rodents, of which they may be ancestral representatives. Tillotherium, one of the best-known members of the group, must have been as large as a small cow. It had plantigrade feet, with five toes.

Tillotson, JOHN (1630-94), archbishop of Canterbury, born near Halifax, Yorkshire, and brought up to Puritan views. He became successively rector of Kedington, Suffolk (1663), preacher at Lincoln's Inn (1663), and dean of Canterbury (1672), being also chaplain to Charles I. (1666). In 1691 Tillotson was, against his own wishes, appointed archbishop of Canterbury in place of the non-juror Sancroft. His *Sermons*, of which a collection in 3 vols., with a Life, edited by Birch, appeared in 1752, are regarded as models of a preacher's discourses and of English writing.

Tilly, JOHANN TSERKLAES, COUNT OF (1559-1632), imperialist general, born at the castle of Tilly in Brabant. After serving under Alexander of Parma and Maximilian I., and against the Turks, Tilly became (1618) the commander of the forces of the Catholic League of Germany. At the outbreak of the Thirty Years' war he defeated Frederick, elector palatine, in the battle of the White Hill at Prague (1620), and recovered Bohemia for the emperor. He then overthrew Count Mansfeld, the margrave of Baden, and Duke Christian of Brunswick, with the result that the emperor obtained possession of the Lower Palatinate, and the Catholic forces spread over the north of Germany. The attempt of Christian IV. of Denmark to intervene on behalf of the Protestant cause

was cut short at the battle of Lutter (Aug. 27, 1626). The landing of Gustavus Adolphus, which synchronized with the dismissal of Wallenstein, was followed by Protestant successes. Tilly's merciless sack of Magdeburg (May 20, 1631) was a blunder and a crime; and on Sept. 17, 1631, he was totally defeated by the Swedish king at Breitenfeld (Lützen). Gustavus thereupon marched to S. Germany, and again defeated and mortally wounded Tilly in the battle of the Lech in Bavaria, April 5, 1632. A stern disciplinarian and a fanatical Roman Catholic, Tilly's character has been traduced by Protestant historians, but has been as much overpraised by his co-religionists—e.g. Klopp's *Tilly im Dreissigjährigen Krieg* (1861) and Villermon's *Tilly* (1859). See books quoted under THIRTY YEARS' WAR.

Tilly Seed, the seed of a small tree, *Croton Pavana*, a native of the Eastern Archipelago. The seeds contain a strongly purgative oil.

Til-seed, or TEEL-SEED, the seed of a plant, *Sesamum indicum*, belonging to the natural order Pedaliaceæ. This plant is cultivated in Egypt, India, and parts of America. The seed is added to broths and cakes by the Jews and other Eastern peoples.

Tilsit, tn., E. Prussia, on I. bk. of Memel, 65 m. by rail N.E. of Königsberg; has glass, soap, and oil works, engineering works, iron foundries, distilleries, and tanneries. Here was signed, between Alexander I. and Napoleon, on July 7, 1807, the treaty of Tilsit. Pop. (1900) 34,539.

Timæus (c. 400 B.C.), a Greek philosopher of the school of Pythagoras, who lived at Locri in Italy, gave his name to one of Plato's dialogues. He is credited with the authorship of a philosophical work entitled the *Soul of the World*. It is, however, considered by scholars to belong to a later time.

Timæus (c. 352-256 B.C.), Greek historian, was a native of Tauromenium in Sicily. About 310 B.C. he was banished by Agathocles of Syracuse, and lived the rest of his life at Athens. His work was a history of Sicily from the earliest times down to 264 B.C. A history of Pyrrhus is sometimes reckoned as a separate work, but it is better regarded as an episode in the main work. His painstaking research is admitted by Polybius, and he paid great attention to exactness of chronology, being the first writer to compute by Olympiads. Only a few fragments of the work survive, for which see Müller's *Fragmenta Historicorum Græcorum* (1841).

Timaru, chief tn. of S. Canterbury, South Island of New Zealand, on the coast, 100 m. S.S.W. of Christchurch. It exports wool, skins, tallow, flour, grain, and frozen mutton, to the value of about one million sterling annually. Pop. (1901) 6,421.

Timber. Good timber should be without sap—the heartwood of a sound tree that has reached maturity. The annual rings should be regular and uniform, and not too wide apart. It should be free from blemishes of all kinds, should smell sweet, and have a silky appearance when newly planed. Among coloured timbers darkness of colour is a sign of strength and durability. The strongest part of a tree is that which contains the rings last formed. Pine, fir, ash, beech, elm, spruce, and oak are generally considered at their best when aged from seventy to one hundred years, though oak may still be good at two hundred years. For all practical purposes the timber used for building and engineering works may be divided into two classes—soft wood, which includes pines, firs, spruce, larch, and all cone-bearing trees and resinous woods; hard wood, including oak, teak, elm, ash, and mahogany—in other words, non-resinous or leaf woods. The joiner generally gives the name fir or Baltic redwood to all the resinous timbers imported from the Baltic and the north of Europe; the fir from America he calls pine; and the spruce from both continents he calls whitewood. A log is a tree with its branches only lopped off; a balk is roughly squared from the log; all other varieties are parallel-sided pieces of timber from two to six inches thick.

Northern Pine.—This tree grows in Scotland and Northern Europe. The carpenter gives it the name of Scotch fir, or Baltic redwood when imported. Swedish and Norwegian redwood have a strong resinous odour, and are of a reddish-yellow colour. When the wood is of good quality the shavings come off short and brittle.

Deals and Battens.—Till thirty years ago Britain drew her largest supplies from Norway and Sweden; she now draws her main supply from Russia. Of late redwood timber, with very little sap, of an excellent quality and of more than average length and depth, has been imported from Siberia. A very fine class of timber is also obtained from Finland.

Canadian and American Woods.—The most useful and popular for the internal finishings of high-class buildings is what the Canadians and Americans describe as white pine, com-

monly known in Britain as yellow pine. Lately the quality and dimensions of this class of timber have deteriorated. Red pine and spruce deals and scantlings from Nova Scotia and Canada are largely used in the west of Scotland and throughout England. Canadian spruce is not equal in strength to Baltic spruce, but has a fine silky texture when planed, the knots being very hard. The red pine is of exceedingly fine grain, with less resin than the Baltic redwoods.

Pitch Pine.—Imports of this timber within the last ten years have increased enormously. It has practically ousted balk timber from the European market. This is chiefly owing to the balks or logs being sawn square, the great average length, and the lasting and weight-bearing properties of pitch pine as compared with Baltic redwood. It is full of resin, and the fibre is straight, strong, and sound.

Oregon and Columbian Pine.—Sawn logs, similar to pitch-pine balks, are supplied in lengths exceeding 100 ft.; and squares of this class of timber are also used. Oregon pine is a resinous timber, and that imported is almost free of sap and knots. It is more delicate in quality than pitch pine, and is liable to decay more readily if the planks are left lying close together when new cut from the log.

Kauri pine, from New Zealand, may be reckoned one of the finest timbers procurable, owing to its silky texture, close grain, cleanliness, and freedom from knots. It is of a yellow straw colour, and is suitable for high-class joinery and cabinetmaking, taking on a high polish and finish.

Balk or log timber consists of the best quality of redwoods, and varies in size from ten to fourteen inches. Riga, has the smallest annual rings, and is of a darker red, while Windau has less sapwood than the other varieties. The whitewood or spruce logs imported from Riga are very coarse, having large knots.

Oak.—Large quantities of sawn planks and boards are imported, kiln-dried, ready for use, from America. The wood is of a pale reddish-brown colour, with a straighter grain, but not so hard, as English oak. Oak in logs of an octagonal shape is imported from Danzig and Libau, with wainscot billets and oak staves from Memel, Danzig, and Libau. Large quantities of wainscot billets are also obtained from Austria. This redwood is a very resinous and strong-grown timber of a brownish-red colour, but is liable to split a little in seasoning.

Mahogany.—The finest wood of this class consists of Spanish

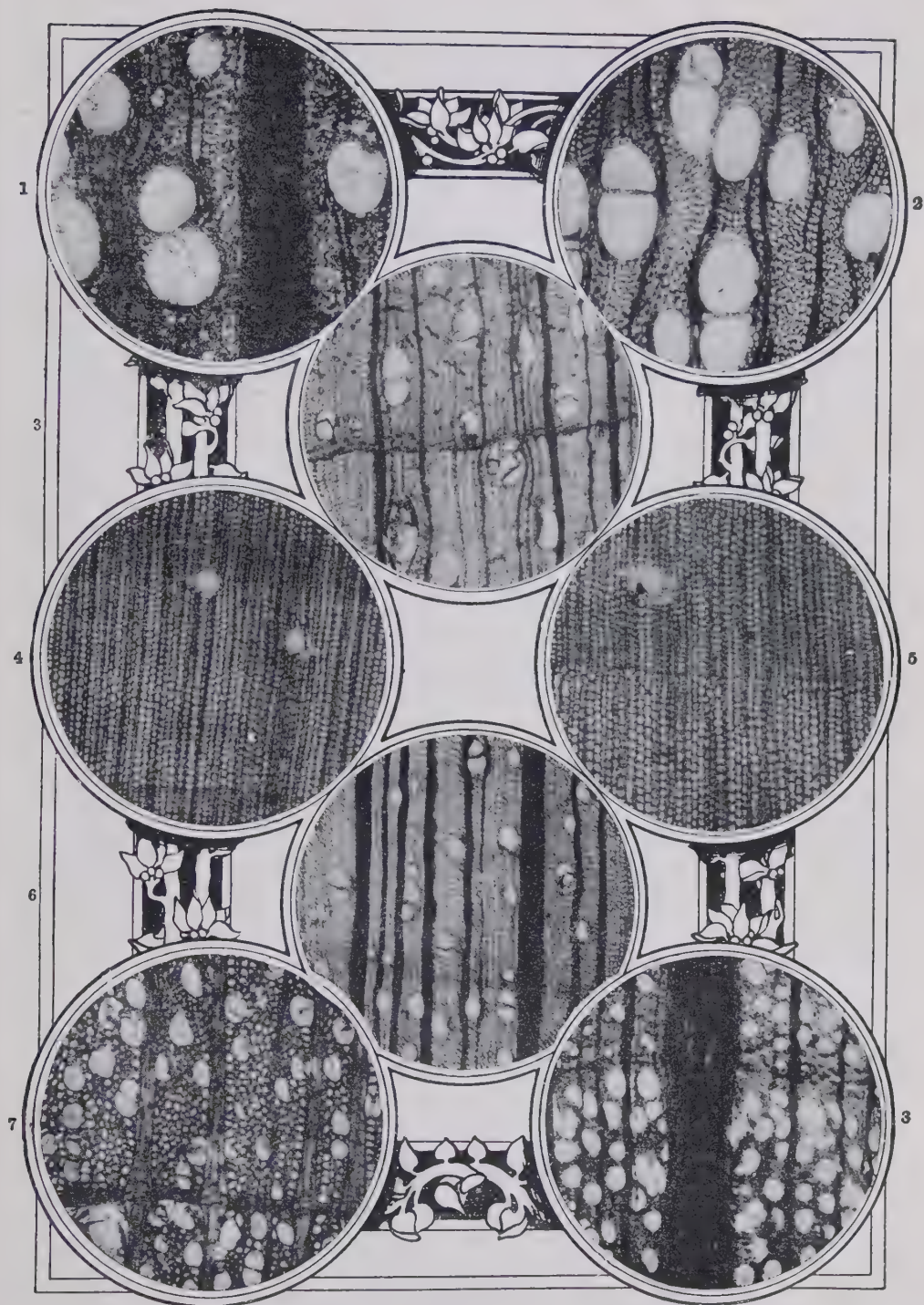
and San Domingo wood. The wide, deep logs are now most difficult to obtain, and fetch extremely high prices. Most of this timber consists of small sizes nine feet long and from eleven to fourteen inches deep. Bay and Tabasco mahogany from Central America are excellent for shape, size, and texture. Within the last ten years African mahogany has been imported in enormous quantities. It is open-grained, and though deficient in colour as compared with Tabasco or Spanish mahogany, can be used for almost any purpose.

Ebony and boxwood in limited quantities are obtained from Africa.

Teak is imported from India and Burma. The best quality comes from Maulmain. It contains an oil which makes it durable, and which prevents the rusting of iron bolts and other fastenings that may be used in framing it together. The annual rings are narrow, but regular and straight grown, and altogether it is a superior wood to oak. It is well adapted for joinery—e.g. stairs, dadoes, doors, and windows—but the outside surface may become bleached by the weather.

Greenheart is imported from British Guiana and S. America, and is the strongest of timbers. It contains an oil which protects it from the attacks of worms. It is very tough, hard, and heavy, and is an excellent wood for piling.

Preservation of Timber.—For the prevention of decay, all wood should be thoroughly seasoned; otherwise the paint closes up the outer pores and confines the moisture in the wood. Creosoting is one of the best methods of preservation; it fills the pores with an oily liquid, destroys insects and fungi, repels worms, and excludes the wet. The timber is placed in a large wrought-iron cylinder. The air is extracted from the cylinder, and consequently from the pores of the wood, and the oil is forced in under a pressure increasing to 150 lbs. per sq. in. The oil then escapes back into the supply tank, and also bubbles out at the safety-valve, indicating that the pores of the timber are filled with it. A batch remains in the cylinder one and a half hours. Soft woods take more oil than hard or very resinous ones. After treatment this timber is well adapted for telegraph poles, railway sleepers, bridges, fences, and piles. Kyan's process, which consisted of injecting corrosive sublimate, in the proportion of one pound to fifteen gallons of water, has now become virtually obsolete. Sometimes, however, timber affected with dry rot is



Timber: Transverse sections, $\times 40$, showing structure.

1. Oak (*Quercus robur*). 2. Ash (*Fraxinus excelsior*). 3. American Black Birch (*Betula lenta*). 4. Northern Pine—Danzig (*Pinus sylvestris*). 5. Yellow or Weymouth Pine (*Pinus strobus*). 6. Sycamore (*Acer pseudo-platanus*). 7. Basswood (*Tilia americana*). 8. Beech (*Fagus sylvatica*).

washed with this preparation to destroy the fungi and prevent a recurrence of the disease. Gardener's process is said to season timber expeditiously, and also to preserve it from decay and from the attacks of insects. It takes from four to fourteen days, according to the bulk and density of the timber, which is placed in open tanks, the sap dissolved out chemically, and the remaining moisture expelled.

The *breaking weight* in lbs., BW of a rectangular timber beam, supported at the ends, may be found by the formula $w = \frac{cbd^2}{l}$,

where c is the strength constant, b and d the breadth and depth in inches, and l the length in feet. For the safe load divide BW by the factor of safety, ten for permanent, six for temporary structures. The deflection δ in inches $= \frac{l^3}{bd^3k}$ in lbs.,

In practice the deflection of a timber beam should not exceed $\frac{1}{16}$ of its length. See also CARPENTRY, JOINERY, and WOOD.

Timber includes such trees as are ordinarily used for building purposes. Timber trees are considered to be part of the freehold, and neither the leaseholder nor a tenant for life may ordinarily cut them; but on some estates timber is grown for cutting at a certain age. A tenant for life under the Settled Land Acts, who is impeachable for waste, cannot cut even seasonable timber without the leave of the court or the consent of the trustees of the settlement, and three-fourths of the proceeds become capital money under the acts. It is a trespass to allow timber to overhang another man's land, and he will be entitled to lop it.

Timbrel, a musical percussion instrument, used by the ancient Hebrews, and supposed to have been a kind of tambourine.

Timbuktu, or TIMBUCTOO, headquarters of the First Military Territory, French Sahara, is situated 9 m. N. of the Niger, in 16° N. and 5° W. It is a great caravan centre, linking the Niger basin with Morocco, Algeria, Tunis, Tripoli, and Egypt. Gums, rubber, gold, wax, ivory, salt, grain are the chief items of trade. Traders form the bulk of the population; cotton, leather goods, embroidery, and pottery are made locally. Telegraph lines are being constructed to connect Timbuktu with the Senegal and with Algeria. Founded by the Tuaregs in the 11th century, Timbuktu was seized by the Moors at the end of the 16th century. They gave place to the Fulahs early in the 19th century, and, except for a slight break, remained in their

hands till 1863. The French took possession early in 1894, and their occupation was acknowledged by Great Britain by the convention of June 14, 1898. The fortifications both at Timbuktu and at the river port, Kabara, have been modernized and strengthened. Pop. 12,000.

Time, our perception of the sequence of events, measured by the regular recurrence of any noted phenomenon. The primary time unit is the period of the earth's rotation, by which the alternations of day and night are occasioned. It is employed in three different methods, giving rise to the systems of sidereal, mean solar, and apparent solar time. Sidereal time is employed only for astronomical purposes. It is the hour-angle of the vernal equinox, and its noon, marked by the transit of that point across a given meridian, coincides with apparent solar noon only once a year, about March 21. Mean solar time is the hour-angle of an imaginary sun travelling uniformly along the celestial equator. It is measured by the intervals between the successive transits of the assumed body, which are of identical length, and nearly 4 min. longer than the corresponding sidereal intervals. Apparent solar or sundial time is the hour-angle of the real sun; but its units, or the intervals between two apparent noons, vary continually, and the practical inconveniences thence resulting have led to its virtual disuse. The maximum divergence of apparent from mean solar time amounts to about 16 min. The most accurate determinations of time are made by observing the transits of 'clock-stars.' These are a collection of standard stars, the absolute right ascensions of which have been fixed with refined care. But the right ascension of a celestial object is nothing else than the instant in sidereal time of its crossing the meridian; hence a detected discrepancy between this instant as recorded by a sidereal clock and the tabular right ascension gives the error of the clock, and establishes the true time. To secure greater accuracy, several stars are usually observed, and the deduced errors averaged; and the clock correction may thus (personal equation being duly eliminated) be rendered exact to $\frac{1}{10}$ of a second. Another method for the ascertainment of time is that of 'equal altitudes.' A star, or the sun, is observed at equal altitudes east and west of the meridian; the arithmetical mean of the times is the moment of its transit; and this, compared with the known place of the object, gives the error of the clock. When

the sun is observed, a correction, readily computed, has to be applied for his slight change of declination during the interval between the forenoon and afternoon measurements. Equal altitude determinations of two different stars of known right ascensions and nearly the same declination serve the purpose as well. The method commonly employed at sea is by a single altitude of the sun or of a *Nautical Almanac* star, the observer's latitude being known. Its altitude having been measured with a sextant and the time noted by the chronometer, its hour-angle can be computed; and this, corrected for the equation of time, gives the true mean time at the instant of observation, and, by comparison, the error of the chronometer on local time. And the error, supposing the chronometer to show true Greenwich time, is equivalent to the observer's longitude. Time can also be determined, by travellers carrying portable instruments, from the transits of known stars across determinate vertical circles.

Local time varies with longitude, one hour of advance or retardation corresponding to 15° of east or west displacement. In moving eastward the hours are anticipated. When it is noon at Greenwich, local clocks mark—at Constantinople, 1 hr. 30 min. P.M.; at Cairo, 2 hrs. 4 min.; at Aden, 3 hrs. 0 min.; at Bombay, 4 hrs. 57 min.; at Calcutta, 5 hrs. 44 min.; at Hong-kong, 7 hrs. 37 min. P.M. To remedy the confusion arising from these diversities, a system of universal time has been introduced.

The distribution of time is one of the most important duties of national observatories. At Greenwich, the dominant establishment in this respect of the world, the errors of the clocks are determined twice daily; hourly time-signals are sent out over the metropolitan area; at 10 A.M. they are dispatched by telegraph to the General Post Office for transmission to the provinces; and at 1 P.M. time-balls are dropped at Greenwich and Deal to enable captains of ships to rectify their chronometers without landing. The Cape observatory similarly prescribes the time for S. Africa, and the naval observatory, Washington, for the United States.

Time-bargain. If A agrees in August to sell to B in December at a price agreed on in August, that is a valid transaction. If A subsequently agrees that he will not deliver the goods, but will pay or receive the difference between the market price in August and that in December, that is also valid. But if the two agreements are simultaneous, the transaction

is a wagering contract, and cannot be enforced. Some call the first transaction a time-bargain, while others apply the term to the two transactions taken together—i.e. to an agreement to pay differences.

Time immemorial, 'or time whereof the memory of man runneth not to the contrary.' In English law a right is considered to be immemorial, or to have existed time out of mind, unless it can be proved that it must have commenced after Sept. 3, 1189, the beginning of the reign of Richard I.

Times, THE. In 1785 John Walter, a bookseller and publisher of Charing Cross, brought out the *Daily Universal Register*, the title of which was in 1788 changed to the *Times and Daily Universal Register*. In the following year, for a paragraph censuring the Duke of York, Walter was fined, and was sent to prison till 1791. When he died (1812) the *Times* was firmly established. But it acquired a much greater influence under the direction of John Walter the second, and a powerful impetus was given to it in its rivalry with other papers by the introduction in 1814 of steam printing presses. This great achievement was followed in later years by further momentous improvements in the mechanical processes of printing, culminating in the invention of the Walter Press, which was perfected in the early 'sixties. In the early years of the *Times* Crabb Robinson acted as its special correspondent, first in Altona (1807) and afterwards in Spain; while the principal leader-writer was Edward Sterling, the father of John Sterling. It was he who earned for the *Times* the title of 'the Thunderer.' Moore and Macaulay contributed verse to the poet's corner; Thackeray reviewed books, and was a general contributor; Lord Brougham wrote leaders for a number of years; and the famous 'Runnymede Letters' were contributed by Benjamin Disraeli. In politics the *Times* generally supported the party in power. Its influence was as great in literary as in political matters. In 1841 the *Times* was instrumental in exposing an elaborate fraud upon the bankers. In 1841 Thomas Barnes, who had been editor since 1816, died, and was succeeded by John Delane, at that time only twenty-four years of age; while six years later John Walter the second's proprietorship passed to John Walter the third. When the Crimean war broke out the *Times*, which was then at the zenith of its power, sent out Dr. (Sir) William Howard Russell as its special correspondent, and his

letters describing the campaign and its mismanagement made a profound sensation. In 1863 Sir William Harcourt wrote his famous 'Historicus' letters on questions of international law, raised by the events of the American civil war; and in 1877 Delane retired from the editorship in favour of Thomas Chenery, who had acted as special correspondent at Constantinople during the Crimean war. Chenery was succeeded in 1884 by George Earle Buckle, the present editor. In 1887 the *Times* published its articles on 'Parnellism and Crime,' including the facsimiles of letters purporting to be written by Charles Stewart Parnell, the leader of the Irish Nationalist party. These articles led to the appointment of a special commission of inquiry, which found the letters to be forgeries. In 1894 John Walter the third was succeeded by Mr. Arthur Walter. A great feature of the *Times* has always been its foreign correspondence. During the great French war, John Walter the first kept a cutter in the Channel to obtain the interdicted French newspapers from fishermen; and in the middle of the 19th century a special overland express was established, with the assistance of Lieutenant Waghorn, for the conveyance of news from the East. The *Times* is the last of the old threepenny newspapers. But its authority and influence are not to be measured merely by circulation: to 'write to the *Times*' is still the birthright of the British subject with a grievance. In 1905 the *Times* started the *Times Book Club* for its subscribers.

Time Tables. See BRADSHAW, GEORGE.

Timoleon (c. 400-337 B.C.), of Corinth in ancient Greece, was called into prominence in 344 B.C. by a request from Syracuse to its mother city Corinth for assistance against its tyrant, the younger Dionysius, and against the Carthaginians. Timoleon was appointed commander of the relieving forces, and left Corinth with about a thousand mercenaries. At Rhegium he managed to outwit a Carthaginian fleet sent to stop him, and landed at Tauromenium. He then defeated the Carthaginians outside Hadranum, and seized that town. Before long Dionysius offered to surrender to him the 'Island' of Syracuse, on condition of being allowed to retire to Corinth. The offer was accepted (343 B.C.); and Timoleon thus gained the fortress of Syracuse. Then Timoleon expelled Hicetas, the Carthaginian general, from the whole of Syracuse, and set about restoring the city's freedom. First he destroyed the tyrant's fortress in the 'Island'; then he collected

from all Greece 60,000 men, with their women and children, to re-people the desolate city; and lastly he restored the democratic constitution. The affairs of Syracuse settled, Timoleon put down the tyrants in other Sicilian cities. But in 339 B.C. the Carthaginians sent a vast armament, landed at Lilybæum, and started to march across Sicily to Syracuse. Timoleon met them, and defeated them at the river Crimissus. In the following year he defeated and captured Hicetas, and also Mamercus, tyrant of Catania; both were put to death by the Syracusans. Messana and all other cities still governed by tyrants were liberated, and deserted cities such as Acragas and Gela were restored. His work done, Timoleon retired into private life, living, blind, near Syracuse. Timoleon fought neither for himself nor for his native country, but simply for freedom, and for what he conceived to be his duty; and he claimed no reward beyond his success. There are *Lives* of him by Plutarch and Cornelius Nepos.

Timon. (1.) Of Athens, the misanthrope, lived in the latter part of the 5th century B.C. On losing his wealth, he was so disgusted with the ingratitude shown to him by his former friends that he retired to the country, and shut himself up in a lonely tower, refusing to see any one except Alcibiades. See Lucian's *Timon* and Shakespeare's *Timon of Athens*. (2.) Of Phlius, Greek philosopher of the sceptic school, and also a writer of the satiric poems called *Silli*—sarcastms on all preceding schools of philosophy and their dogmas. He flourished about 280 B.C. He also wrote burlesque epics, dramas, and philosophical works; only a few fragments of his writings are extant. For these see Brunk's *Analecta* (1772-6) and Wölke's *De Græcorum Syllis* (1820).

Timor, the largest and most easterly island in the Lesser Sunda Is., Dutch E. Indies; area, 12,390 sq. m. Its coasts are rugged, and the interior is said to be mountainous and well wooded. There is an extremely scanty rainfall. The population has been estimated as high as 750,000. The N.E. part is Portuguese, the greater part of the S.W. Dutch. The former, including the island of Kambing, has an area of 7,400 sq. m., and has its headquarters at Dilli, in the N. Coffee is its principal export. The latter covers an area of over 5,000 sq. m., and its chief town, Kupang, on the S. coast, is also the chief town in the Dutch Residency of Timor, which includes the S.W. portion of Timor, the islands of Roti and Peman, the Savu,

Sumba, Solor, and Allor groups, and the E. half of Flores.

Timor-Laut, group of islands (2,060 sq. m. in area) in the Malay Archipelago, belonging to the Dutch, 250 m. N.E. of Timor, and between the Banda and Arafura seas. The large islands (Yamdena and Selaru) are hilly and well wooded; the smaller islands (Tenimbar) are low and of coralline formation. The exports are trepang, turtle, and pearl oysters. Pop. 24,858.

Timotheus. (1.) Of Athens, Athenian general. In 376 B.C. he secured an alliance with Corcyra, and also defeated a Spartan fleet; in 373 he was tried and acquitted for having been dilatory in sailing to Corcyra; in 365 he secured Samos for Athens, and afterwards Potidæa and other towns; and in 363 and 362 he besieged Amphipolis. But in 355 he was condemned to a fine of 100 talents (£23,000) for failing to assist Chares in an engagement in the social war in 358. Unable to pay the fine, he retired to Chalcis in Eubœa, where he soon afterwards died. In 376 he was a friend of Isocrates. (2.) Of Miletus (c. 446-357), Greek dithyrambic poet, and an innovator in music; he lived chiefly at Athens. He headed an eleventh string to the lyre. In his poetry he was daring, both in the treatment of his subject and in his style. Of his many poems only a few lines remain, for which see Bergk's *Poeta Lyrici Græci*. (3.) Of Athens, sculptor, a contemporary with Scopas and Praxiteles; he was one of the four artists employed to decorate the mausoleum about 350 B.C.

Timothy, or **TIMOTHEUS**, a younger companion of the apostle Paul, was the son of a Greek father and a Jewish (proselyte?) mother, Eunice, and was converted by Paul at Lystra or Derbe. He joined the apostle on his second missionary journey, and became his most attached colleague, being trusted with various important commissions among the churches, and sharing in his imprisonment at Rome. According to 1st Timothy, he was left in full charge of the church at Ephesus, where he is traditionally reputed to have been martyred. His commemoration day falls variously on January 22 (Greek Church), January 23 (Coptic), and January 24 (Latin).

Timothy, THE FIRST AND SECOND EPISTLES OF PAUL TO, together with the Epistle to Titus, are known as the pastoral epistles, being largely composed of counsels regarding the oversight of churches. Their authenticity has been assailed on various grounds—e.g. the impossibility of finding a place in the narrative of Acts consonant with the historical

situation they premise; the advanced development, both of the heretical teaching against which they give warning, and of the organization of the churches; the striking differences between them and the other epistles of Paul in regard to style and vocabulary. Schleiermacher, contesting the genuineness of 1st Timothy, gave the lead to the more drastic treatment of all; and scholars, such as Schweigler, Meyer, Sabatier, Beyerschlag, Harnack, Von Soden, have pronounced against the group as a whole. The defenders of the apostle's authorship do not deny the premises from which the critical conclusion is drawn, but they seek generally to evade the inference by assuming that the pastorals date from a period in Paul's life later than the record of Acts—that, in fact, he was released from the imprisonment in which Acts leaves him, made the journeys mentioned in 1st Timothy and Titus, and was again put in bonds, as seen in 2nd Timothy. This likewise is supposed to afford a sufficient interval to account for the changed style (in part, at least), and for the development of heresy and church organization. A number of scholars, again, hold a mediating position. They regard these writings as containing genuine Pauline materials, less or more, but as having been wrought into their present shape by later hands. The first epistle warns Timothy against erroneous speculations and ascetic tendencies, probably Gnosticism in its beginnings; gives directions regarding public prayer, the deportment of women, the appointment of bishops and deacons; and touches many points of Christian character and conduct. The second epistle also speaks of defections and heresies, contains fatherly admonitions, and, in the concluding chapter, reveals the thoughts and feelings of the apostle in face of his imminent death. See Holtzmann's *Pastoralbriefe* (1880); Bernard's *Camb. Greek Testament* (1889); Humphreys' *Camb. Bible* (1897); Sabatier's *Apostle Paul*, appendix by Findlay (1891); Von Soden in *Hand-Commentar*, etc. (2nd ed. 1893); Moffat's *Hist. of the New Testament* (1901).

Timothy Grass, a hard, somewhat coarse grass (*Phleum pratense*), which is extensively cultivated in N. America and Great Britain as an ingredient of permanent pasture. It does best in rather heavy soil.

Timucuas, properly ATIMUCA, a North American people, formerly dominant in Florida, who were exterminated or absorbed by the Muskogean Seminoles. They spoke a stock language, or at

least one radically distinct from any other in the United States, but showing some affinities with Carib. They are the Timuguanas of some of the early writers.

Timur Beg (1336-1405), more familiarly known as Tamerlane, was born in Bokhara. Becoming master (1369) of Transoxiana or Samarkand, he in 1391-6 conquered the whole of the country lying between Khorassan and the Caspian, as well as Persia, Armenia, Georgia, and Circassia. Towards the close of 1398 he invaded India. Within a year Delhi was at his feet, and Timur Beg was proclaimed emperor of Hindustan. But the designs of the Turkish Sultan Bajazet compelled Timur Beg to return to Samarkand, whence, after a brief rest, he invaded Syria, sacked Aleppo, captured and destroyed Damascus and Bagdad, and penetrating into Anatolia won (1402) a brilliant victory over Bajazet at Angora. In his seventieth year he planned the invasion of China, and died on his march to the Chinese frontier. Nothing can excuse his inhuman atrocities and cold-blooded massacres of thousands of prisoners and non-combatants. He had no constructive or administrative ability, and no attempt was made to consolidate empire. After Timur Beg's death his dominion crumbled away. See *Histoire de Timur-Bey*, by Sherif-ed-Din (Fr. trans. by Pétis de la Croix, 1722).

Tin, Sn, 119.0, a metallic element found in nature as stannite, SnO_2 . The washed ore is roasted, to oxidize and remove sulphur and arsenic, and is then smelted with powdered anthracite in a reverberatory furnace with a deep hearth. The carbon of the anthracite displaces the tin, which is tapped off and purified, first by liquation, by which the tin is melted out from the impurities, and further by stirring the molten metal with poles of green wood, by the gases of which the remaining impurities are carried to the surface. Tin is a silver-white, malleable, and somewhat ductile metal, but is of low tenacity and of highly crystalline structure. The metal breaks up into columnar fragments if heated to near its melting-point and dropped from a height. Tin has a specific gravity of 7.3, melts at 232° C., boils at 1,500° C., and is a poor conductor of electricity. It takes a high polish, and being but little acted on by the air, is largely used to coat other metals to prevent them from rusting or corroding. (See TINPLATE.) Tin is also used to line copper vessels and lead pipes, to prevent these poisonous metals from dissolving and contaminating foods and water.

Heated in air, tin rapidly oxidizes, forming tin dioxide, SnO_2 , a white insoluble powder that is used for polishing under the name of 'putty powder.' Tin dioxide is of feebly acid properties, forming stannates with basic oxides, and of these sodium stannate is used in calico-printing. The most important compounds of tin are probably the chlorides. Stannous chloride, SnCl_2 , is prepared by heating tin with gaseous hydrochloric acid—a hydrated salt known as tin salts, $\text{SnCl}_2 \cdot 2\text{H}_2\text{O}$, being obtained if solution of hydrochloric acid is used. The latter is employed to a considerable extent as a mordant. Stannic chloride, SnCl_4 , is obtained as a fuming liquid, when tin is acted on by chlorine, and is converted into hydrates by water; the latter are also used in dyeing. See Fawns's *Tin Deposits of the World* (1905). See also MOSAIC GOLD.

The world's output of tin in 1903 amounted to 98,300 metric tons, of which 60,980 tons were produced in the British Empire, 18,400 in Bolivia, 15,450 in the Dutch E. Indies, and 3,250 in Spain.

Tinamou, a general name for the members of the order Tinamiformes, American birds of somewhat anomalous structure. In appearance tinamou resemble partridges; they are ground forms, feeding on seeds, roots, berries, and insects. Their flight is very swift, but they can also run with great rapidity, and usually occur among dense undergrowth. Six species are found in Mexico, and the remainder are confined to S. America. In certain points connected with the skeleton tinamou recall running birds, while in other respects they show a marked resemblance to game-birds. They are probably primitive forms, and their isolated position is shown by the fact that they constitute an order by themselves. An example is *Rhynchotus rufescens*, the great tinamou.

Tincal. See BORAX.

Tinchebrai, tn., dep., Orne, Normandy, France, 26 m. W.S.W. of Falaise; has manufactures of combs and iron goods. It was the scene of the defeat and capture of Robert, Duke of Normandy, by his brother, Henry I. of England, on Sept. 28, 1106. Pop. (1901) 4,421.

Tincture, one of the metals, colours, or furs used in heraldic achievements. See HERALDRY.

Tinctures, alcoholic extracts of drugs prepared, according to the ease or completeness with which they are soluble, by macerating the material in alcohol for some days and straining off the clear solution, percolating the

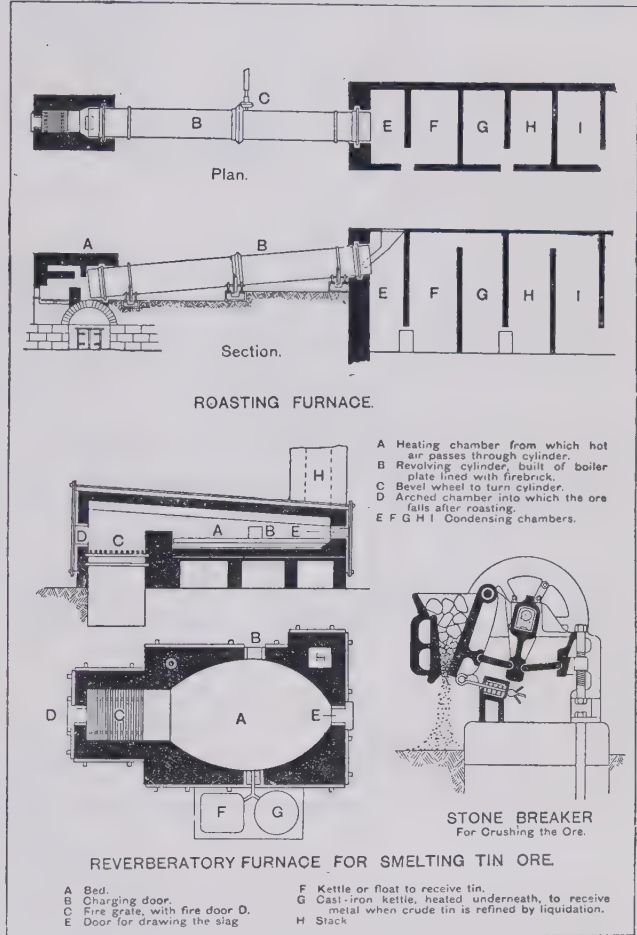
solvent slowly through the substance containing the drug, or by simply dissolving the drug directly. Laudanum, tincture of arnica, and tincture of iodine are typical examples.

Tindal, MATTHEW (?1653-1733), English deist, was elected a fellow of All Souls, Oxford. In 1685 he became an advocate at Doctors' Commons, and won some

Church party. See his *Memoirs*, by Curll (1734).

Tindal, WILLIAM. See TYNDALE.

Tinder, an inflammable stuff, usually made of charred linen, in earlier times used in kindling fires. Ignited by sparks struck by steel from flint, the tinder next set fire to a sulphur match. Partially decayed wood, amadou (German



Tin Manufacture.

reputation for his knowledge of international law. He published many pamphlets of a controversial nature, chiefly on the relations between church and state, his most important treatises being *The Rights of the Christian Church asserted against Romish and all other Priests* (1706), and *Christianity as Old as the Creation* (1730). Both aroused a storm of refutation from the High

tinder), and touch-paper were also used for tinder.

Tinea, a term applied to a group of skin diseases caused by the growth of parasitic vegetable fungi in or upon the epidermis. The commonest is *T. tonsurans*, or ringworm. See RINGWORM.

Tineidæ, a family of moths, including the clothes moths. See MOTHS.

Tinfoil. See FOIL.

Tinned Meat. See CANNING.
Tinneveli, munic. tn. and cap. of Tinneveli dist., Madras Presidency, India; a centre of Protestant missions in S. India. It has a fine Siva temple. Pop. (1901) 40,469. The district has an area of 5,381 sq. m., and a population of 2,059,607.

Tinos. See TENOS.

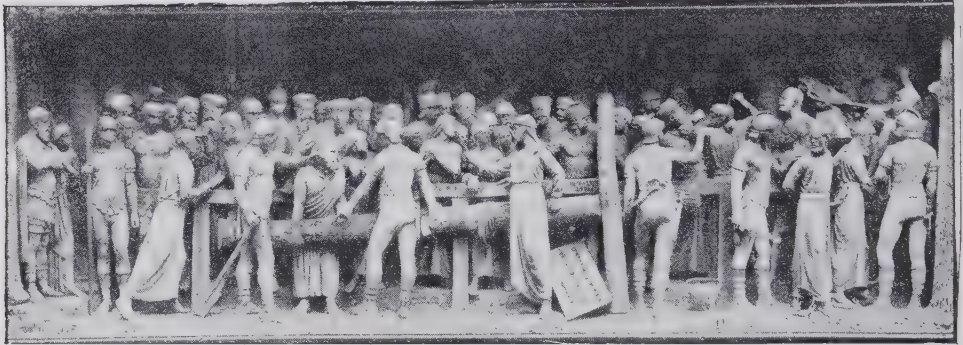
Tinplate, a sheet of wrought iron or mild steel that has received a coating of two or three per cent. of tin by immersion in the molten metal to protect it from rust. It is chiefly used for making the cans in which fruit, meat, fish, biscuits, and so forth are enclosed for preservation. If not required to come in contact with food, the tin may be mixed with some lead, and a cheaper variety of sheet called *terneplates* is produced. Tinplates have this disadvantage that, owing to tin being electro-negative to iron, as soon

with the surrounding grounds were purchased by government in 1900.

Tintoretto, properly **GIACOPO ROBUSTI** (1518-94), an Italian painter, a superb colourist, the last great master of the Venetian school, and one of the most imaginatively dramatic of all painters. His aim was to attain to 'the design of Michel Angelo, the colour of Titian.' Nicknamed *Il Furiioso*, from the ardent rapidity of his brush, he was so unequal that his compatriots said of him he had three pencils—one of gold, one of silver, one of lead. He entered Titian's studio, but left after ten days, and thereafter worked alone, self-taught. He reared a shrine to his own genius in his famous decorations of the *Scuola di San Rocco*, and his *Last Judgment*, in the ducal palace. He brought the poetry of *chiaroscuro* to its perfection; in portraiture he rivalled Titian. He lived mainly in Ven-

area of 2,499 sq. m., is flat and well cultivated. Rice, the staple crop, is largely exported. Pop. (1901) 2,117,991. The administrative headquarters are located at Comillah.

Tipperary, inland co., Munster prov., Ireland. The north-central and western parts are mountainous—Keeper Hill (2,278 ft.); in the s., Galtee Mts. (Galteemore, 3,015 ft.), Knockmealdown Mts. on Waterford border (2,520 ft.), and Slievenaman (2,364 ft.). The Bog of Allen extends westward from Kilkenny; in the s.w. is the Golden Vale, of rich fertility; in the n. the low fertile land of the Ormond baronies; and in centre the Suir valley. Rivers—Shannon, N.W., with Little Brosna and Nenagh; and Suir, centre and s. Lough Derg lies on N.W. border. Agriculture is the chief industry. More than half of the cultivated land is under meadow and clover, live stock are numerous, and



Panel by Tinworth—'Going to Calvary.'

(By permission of Messrs. Doulton.)

as a portion of the protective covering is worn off, the iron, if exposed to moist air, rusts more rapidly than ever.

Tinsel consists of very thin sheets of brightly-polished metal foil. These are usually of copper or brass, are often thinly silver-plated on one side, and sometimes coated with coloured lacquers. It is used for the ornamentation of dresses, and so forth.

Tinstone. See CASSITERITE.

Tintagel Head, Cornwall, England, 5 m. N.W. of Camelford. An isthmus connects the head with the mainland. There are extensive ruins of an ancient castle, the traditional birthplace of King Arthur.

Tintara, a red Australian wine, very similar to Ophir, but more full-bodied, and possessing a strong ferruginous flavour.

Tintern Abbey, Gloucestershire, England, near the Wye, 5½ m. N. of Chepstow. The ruins are remarkably picturesque, and

ice; a musician, lover of all the arts, and versed in mechanics. His best work is in Venice, though there are good examples at Hampton Court, and in the National Galleries of London and Edinburgh. See John Ruskin's *Relation between Michelangelo and Tintoretto* (1872); J. Addington Symonds's *Renaissance*, vol. iii. (1893); B. Berenson's *Venetian Painters* (1894); and Kugler's *Italian Schools of Painting* (1887).

Tinworth, **GEORGE** (1843), English modeller to the Doultons at Lambeth pottery, born in Waltham; has executed a large number of memorial and other panels in terra cotta, notably those in the Guards' Chapel, York Minster, and Wells Cathedral—his best work being *Going to Calvary* (1879) and *Preparing for the Crucifixion* (1881). See Gosse's *A Critical Essay on the Life and Works of George Tinworth* (1883).

Tipperah, dist., Chittagong div. of Bengal, India, with an

butter factories are established at various places. Coal, copper, lead, and zinc occur, but are little worked; other minerals are fireclay, slate, and limestone. Tipperary returns four members to Parliament. Remains of ancient castles and ecclesiastical buildings are numerous (Cashel, Ardinnan, Athassel, Holycross), with many Irish and Danish earthworks. Area, 1,659 sq. m. Pop. (1901) 160,232.

Tipperary, tn., Co. Tipperary, Ireland, 13 n. w. by s. of Cashel. It has a handsome Roman Catholic church, also Anglican and Scots churches. There are extensive military barracks, and a condensed milk factory. Near the town is the Glen of Aherlow. Pop. (1901) 6,281.

Tippermuir, or **TIBBERMORE**, 5 m. W. of Perth, Scotland, was the scene, on Sept. 1, 1644, of the first battle between Montrose and the Covenanters, the latter being defeated.



A Picture by Tintoretto—'St. Mark freeing a Slave from Punishment.' In the Academy of Fine Arts, Venice.

Tippling Act, 1751. By this act no debt under twenty shillings for spirituous liquors is recoverable unless it was contracted at one time. A person taking a pledge for the payment of such a debt is liable to a fine of 40s., half to go to a common informer. By an amending act of 1862, spirits sold in quantities of not less than one pint, to be drunk off the premises, are exempted.

Tippoo Sahib. See TIPU SAHIB.
Tippoo Tib, whose proper name was HAMUDI BEN MOHAMMED, an African slave-trader of Arab descent. He is chiefly known be-

never ceased to cherish the hope of being able to expel them from Hindustan. He invaded Travancore in 1789; but the result of the war was to deprive him of half his territory, to compel him to pay a heavy indemnity, and to give his two sons as hostages. Lord Mornington having obtained evidence of Tipu's intrigues with the French, determined, in 1798, to crush his power. In the following year Seringapatam, the capital of Mysore, was captured after a month's siege, Tipu being killed in the final assault. See Mir Hussain Ali Khan's *The History*

deal with Italian literary history from the earliest beginnings till 1700. In 1803 T. J. Mathias published an Italian compendium in 3 vols. of those sections that deal with poetry only; while Count Barbacovi's condensation of the earliest period was translated into English (1835). Tiraboschi's other works deal mainly with the literature, history, and art of Modena. Since his centenary year (1894) a large mass of his valuable correspondence has been published.

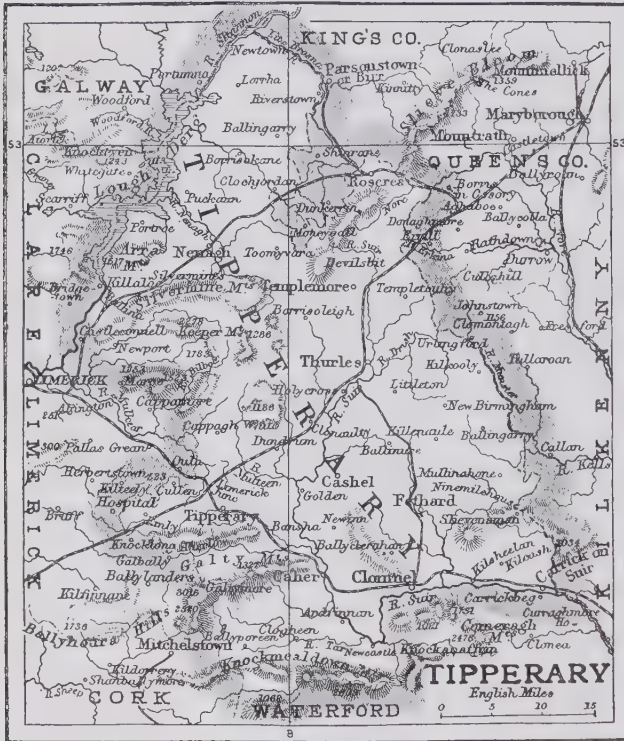
Tirah Campaign. A campaign organized in 1897 by Sir William Lockhart against the Afridis and the Orakzais in the Tirah Valley, on the N.W. Indian frontier. Chief among the brilliant incidents of the campaign was the engagement at Dargai (Oct. 21), where a difficult height was scaled and captured under a deadly fire, the Gordon Highlanders specially distinguishing themselves in this action. See Shadwell's *Lockhart's Advance through Tirah* (1898), and Hutchinson's *Campaign in Tirah* (1898).

Tiraspol, tn., Kherson gov., S.W. Russia, 64 m. N.W. of Odessa, on the Dniester. Formerly an important fortress, dismantled in 1835, Tiraspol is now a small river port. Its horticulture is famous, and it has manufactures of tobacco and candles, tallow foundries, and flour mills. Pop. (1901) 29,323.

Tiree. See TYREE.
Tiresias, in ancient Greek legend, a soothsayer, a native of Thebes, who from his seventh year was blind, either because he saw Athena whilst bathing, or because he told men secrets of the future which they should not have heard. He was the adviser of Oedipus, of the latter's sons, and of Creon; and it was to visit him that Odysseus descended into Hades.

Tirhut, former district of Bengal; since 1875 divided into the districts of Darbhanga and Muzaffarpur.

Tiridates, the name of Parthian and Armenian kings. (1.) A chieftain of the Parthians or Dahe, a Scythian tribe—at any rate, an Iranian nomad tribe—was the founder of the Arsacid dynasty, and reigned over Parthia from 248 to 211 B.C., and defeated Seleucus Callinicus, king of Syria. (2.) Was made king of Parthia about 30 B.C. by a revolt against Phraates IV.; but the latter was soon restored (26 B.C.), and Tiridates took refuge at Rome. (3.) Was placed on the Parthian throne in 35 A.D. by the Roman emperor Tiberius, but after reigning about a year was forced to take refuge in Syria. (4.) TIRIDATES I. of Armenia was made king (c. 52 A.D.) by



cause of his association with Stanley in 1876, and also on account of the part he played in the Emin relief expedition of 1887. See H. Brode's *Tippu Tip* (1906).

Tipstaff, an officer of the High Court, whose duty it is to arrest and take into custody persons committed to prison by the court.

Tipton, par., Staffordshire, 1 m. N.E. of Dudley. It has coal-mining and manufacture of heavy iron goods. Pop. (1901) 30,543.

Tipu or Tippoo Sahib (1749-99), the 'Tiger of Mysore,' was the son of Haidar Ali, whom he succeeded in 1782. He continued the war against the British, and

of Tippoo Sultan (trans. Miles, 1844), and Bowring's *Haidar Ali and Tippu Sultan* (Rulers of India Series, 1894).

Tipula. See CRANE-FLY.
Tiraboschi, GIROLAMO (1731-94), Italian literary historian, was born at Bergamo. After teaching in schools at Milan and Novara, he held the chair of rhetoric at the Brera of the former town. From 1770 till his death he was librarian to Duke Francis III. of Modena. His great work is the *Storia della Letteratura Italiana* (13 vols. 1772-81; best ed. 16 vols., 1822-26, with Vita by Fabroni), the first attempt to

his brother, Vologeses or Volagases I., king of Parthia; but he did not reign effectively until 61 A.D. The Roman general Corbulo drove him out of Armenia, but in 66 A.D. he received the crown from Nero at Rome. (5.) **TIRIDATES III.** was the son of Chosroës, king of Armenia, and spent some thirty years with the Romans, until in 259 he was placed on the Armenian throne. He made Christianity the state religion (294).

Tirlemont (Flem. *Tienan*), tn., prov. Brabant, Belgium, 30 m. E.S.E. of Brussels; has manufactures of woollen goods, leather, and machinery. Pop. (1900) 17,855.

Tirnovó, or **TRNOVO**, tn., cap. of prov. of same name, Bulgaria, at N. base of Balkans, 35 m. S.S.E. of Sistova; has dyeing and manufacture of copper goods. It was the capital of Bulgaria till 1393. Pop. (1893) 12,858.

Tiro, **MARCUS TULLIUS** (c. 94 B.C.-5 A.D.), a freedman of Cicero, whose secretary and confidential servant he became. He is credited with the invention of a system of shorthand, used by the Romans under the empire; this is doubtful, but abbreviations common in MSS. have been known since 500 A.D. as *Notæ Tironianæ* ('Tiro's characters'). He himself wrote works on the Latin language, a life of Cicero, and a collection of his jests, all now lost. See Boissier's *Cicéron et ses Amis* (ed. 1902), and Mitzschke's *M. T. Tiro* (1875).

Tirso de Molina, **GABRIEL TELLEZ** (1571-1648), Spanish dramatist, became in 1632 the official historiographer of his order, the Brothers of Charity, and subsequently prior of Soria. His best dramatic work was mostly done in his earlier years, but was preceded in publication by his collection of tales, *Cigarrales de Toledo* (1621). His most famous tragic play is *Don Juan* (*El Burlador de Sevilla*), but his comedies are extremely sparkling, and are still popular on the stage. The best are *Don Gil de las Calzas Verdes*, *El Celoso Prudente*, *El Vergonzoso en Palacio*, and *Amar por Arte Mayor*. Several of his plays were appropriated or utilized by Calderon. His dramas have been published in Rivadeneyra's collection, and edited by Hartzenbusch (1839-42). A series of more serious tales than *Cigarrales* appeared later, called *Deleitar Aprovechando* (1635). See *Obras*, cited above, and *Tirso de Molina*, by Cotarello y Mori (1893).

Tirupati, munic. tn., N. Arcot dist., Madras, India, 70 m. N.W. of Madras. Its famous hill pagoda, said to have been built 3100 B.C., is a pilgrim resort. Pop. (1901) 15,485.

(8)

Tirupatur, tn., Salem dist., Madras Presidency, India, 48 m. S.W. of Vellore; has exports of grain and hides. Pop. (1901) 18,689.

Tiruvannamalai, tn., S. Arcot dist., Madras Presidency, India, 50 m. S. of Vellore. Its fortified hill (2,668 ft.) was an important

illustrated by the story of Hercules, who, though lord of Tiryns, was compelled to perform his labours at the bidding of Eurystheus, king of Mycenæ. The history of Tiryns is almost entirely legendary. The ancient fortress was probably destroyed about 1100 B.C. by the invading



Views in Tiryns.

1. The Acropolis. 2. Arched passage. 3. Citadel wall.

military post during the time of Haidar Ali (1759-82). Pop. (1901) 17,069.

Tiryns, one of the most ancient fortresses in Greece, was situated in Argolis, at the head of the Gulf of Nauplia, 6 m. S.E. of Argos. After Perseus's foundation of Mycenæ, Tiryns was subject to that city; this fact is

Dorians, though a city did continue to exist on the site until the 5th century B.C. But in 468 B.C. the jealous Argives destroyed both Mycenæ and Tiryns. From that date the site was deserted and untouched until the middle ages. Tiryns has always been, and still is, renowned for its fortress. It stands on a

limestone rock, which rises only 50 ft. above the surrounding plain. The circuit wall surrounding the whole citadel is built of huge Cyclopean stones, varying in thickness from 16 to 57 ft.; the greatest height as they stand is 24 ft. 6 in. The hall of the palace is 38½ ft. long by 32 ft. wide; its floor is paved with concrete, originally painted in red and blue squares. Four central columns supported the roof; between them was placed the hearth. Entirely detached from the men's apartments, and reached only by a circuitous approach, was a similar court and hall for the women. The walls show effects of fire, by which, no doubt, the palace was destroyed. The walls of the men's hall and other rooms were adorned with paintings. Pottery has also been found, with pictures of animals, and in one case even of men, and terra-cotta images of various kinds. The best specimens of pottery are of the same kind as the best found at Mycenae, and date the existence of the fortress at from 1500 to 1100 B.C. The site was not regularly built on until Byzantine times; then a Byzantine church was erected in the great courtyard of the palace. The ancient town must have stood on the low ground outside the walls. See Schliemann's *Tiryns* (Eng. trans. 1886), Schuchhardt's *Schliemann's Excavations* (Eng. trans. 1891), and Frazer's *Pausanias* (1898).

Tischendorf, LOBEGOTT FRIEDRICH KONSTANTIN VON (1815-74), German Biblical critic, was born at Lengenfeld, Saxony; became a lecturer at the University of Leipzig (1839), and a professor in 1845. He is noted, not only as a master in the text of the New Testament, but as an adventurous traveller in search of ancient MSS. His great discovery was the Codex Sinaiticus at Mount Sinai, editions of which he published in 1862 and 1863. He issued twenty-four critical editions of the New Testament from 1841, an edition of the Septuagint (1850), and *Wann Wurden Unsere Evangelien verfasst?* (1865; Eng. trans. 1866). The 8th ed. of his great *Critical Edition of the New Testament*, with prolegomena (1864-72), was completed by C. R. Gregory. See *Life*, in German, by Volbeding (1862).

Tissaphernes, Persian satrap (414 B.C.) of Lower Asia, in the reign of Darius II. He aided the Spartans against Athens in the Peloponnesian war, but was suspected of trying to weaken both belligerents. In 401 B.C. he was one of the four generals who commanded Artaxerxes' army at Cunaxa against Cyrus the

younger; he afterwards treacherously murdered the officers of the 10,000 Greeks. Subsequently he was made governor of all maritime Asia Minor, and carried on war against the Spartans under Agesilaus. In 395 B.C. he was executed by order of Artaxerxes.

Tisserand, FRANÇOIS FÉLIX (1845-96), French astronomer, was born at Nuits Saint-Georges in Côte-d'Or. He entered the Paris observatory in 1866, observed the total solar eclipse of Aug. 18, 1868, in Siam, and took part in expeditions for observing the transits of Venus in 1874 and 1882. Appointed in 1873 director of the observatory of Toulouse, and ten years later professor of celestial mechanics at the Sorbonne, he succeeded Admiral Mouchez in 1892 as director of the Paris observatory. He communicated to the Academy of Sciences, in 1869, the first of a long series of memoirs on planetary theories, and embodied his final results in *Traité de Mécanique Céleste* (4 vols. 1889-96).

Tissot, JAMES JOSEPH (1836-1902), French painter, born at Nantes. He was a pupil of Ingres and Flandrin, and exhibited at the Salon from 1857. His artistic career falls into three distinctive periods. In the first he painted in the traditional classic manner, the *Faust et Marguerite* (1861), now in the Luxembourg at Paris, being a typical example. In the second period he painted portraits, and illustrated the shady side of Parisian life—e.g. in *La Femme à Paris*. He lived in England for some ten years after 1871, and learned etching from Sir Seymour Haden. His third period begins in 1886, when he proceeded to Palestine, and stayed there four years. The result, 365 small water colours illustrative of the *Life of Our Lord Jesus Christ*, created a profound impression when exhibited in Paris (1894) and in London (1896). At the time of his death he was engaged upon a similar series to illustrate the *Old Testament* (1905) narratives.

Tissue, in biology, is a term applied to any structure composed of cells and cell products. The functions and characters of the predominant cellular units necessarily determine the nature of a tissue, which may be cellular, osseous, muscular, connective, glandular, nervous, and so forth. The principal substance of the elastic fibre characteristic of certain tissues is elastin, a body closely resembling albumin, but without any sulphur. Vegetable tissues are generally simpler than those of animals, and consist mainly of (1) epidermal or covering cells, (2) fibro-vascular bundles, and (3) fundamental or less highly differentiated cells.

Tisza, KOLOMAN, of Borosjenő (1830-1902), Hungarian statesman, born in the co. of Bihar; was elected a member of the Hungarian parliament (1861); founded (1875) a new parliamentary party, chiefly composed of the followers of Deák, and at the same time became prime minister, a position he held for fourteen years. He was, perhaps, the most successful statesman Hungary has produced in modern times. After resigning over the proposed Austrian occupation of Bosnia and Herzegovina, owing to financial reasons, he again assumed office, which he retained till 1890. It was through him that Transylvania was Magyarized. See *Visi's Koloman Tisza* (1886).

Tit, or **TITMOUSE**, a name given to the members of the family Paridae, which are passerine birds of small size, frequenting trees. The food consists chiefly of insects and their larvæ, though the birds will also eat seeds. The beak is short, conical, and entire, the nostrils being covered by bristles; the wings are weak, and the strong anterior toes are partially united. The species are specially common in the forest regions of northern Europe and Asia. About six species occur in Britain, the most familiar being the blue tit or tomtit (*Parus caeruleus*), which is only slightly over four inches in length, and has the greater part of the head, as well as the wings and tail, coloured blue, while the throat is black, the upper surface greenish, and the under surface yellow. The bird, like its allies, builds its nest of wool and moss, mixed with feathers and hair. The female defends her nest with great pugnacity. Other species are the coal-tit (*P. ater*), in which the head is black and white; the great tit or ox-eye (*P. major*), which reaches five and three-quarter inches in length, and will attack and eat small birds; the marsh tit (*P. palustris*), in which the head is entirely black. In parts of Scotland the crested tit (*P. cristatus*) is a resident species, while it also occurs in England as an occasional visitor. To the genus *Acredula* belongs the long-tailed tit (*A. caudata*), which is not uncommon in England and Wales, and is found in parts of Scotland. In the bearded tit or reed pheasant of Norfolk (*Pannurus biarmicus*), the feathers at the side of the throat are elongated to form a moustache. This species is now rare in England.

Titan, Saturn's sixth and largest satellite, discovered by Huygens in 1655. It has a diameter of about 2,000 m., and revolves round its primary at a distance of 771,000 m., in a period of nearly sixteen days.

Titanium. See MAB.

Titanium, Ti, 48.1, a metallic element of the tin group, occurring naturally as its oxide, TiO_2 , as rutile, brookite, and anatase; in various titanates; and, with oxide of iron, in many titaniferous iron ores. Titanium may be prepared by displacement from its oxide by heating with aluminium, or by electrolysis of the solution of the oxide in calcium chloride, and is a lustrous white metal of specific gravity 3.5. It burns brilliantly in air, and readily unites with nitrogen. Its chief compounds are its oxide, TiO_2 , a crystalline solid of feebly acid properties, from which the titanates are derived; the halides of the type TiX_3 , which are volatile liquids decomposed by water; and the nitride, a compound of metallic lustre.

Titans, in ancient Greek mythology, were the children of Uranus and Gæa; their names were Cronus, Oceanus, Coeus, Crius, Hyperion, Iapetus, Theia, Rhea, Themis, Mnemosyne, Phoebe, Tethys, and Dione. They rebelled against their father, deposed him from the sovereignty of the gods, and made Cronus ruler of heaven; he married his sister Rhea. But his children, headed by Zeus, in their turn warred against him and the other Titans. The battle ground was Thessaly, the Titans holding Mt. Othrys, and Zeus and his fellows Olympus. At last Zeus won the victory by the aid of the Cyclopes, who armed him with thunder and lightning; he cast the defeated Titans into the depths below Tartarus. The name Titan is also given to children of the Titans proper, such as Prometheus, Hecate, Latona, Helios, and Selene. See Hesiod's *Theogony*; Keightley's *Mythology of Ancient Greece and Italy* (4th ed. 1859), and Preller's *Griechische Mythologie* (ed. 1888). The myth is beautifully treated in Keats's *Hyperion*.

Tit-Bits was founded by Mr. (now Sir) George Newnes in 1881. This serving up of interesting items of information on all sorts of subjects, interspersed with humorous anecdotes, short stories, and popular articles on 'catchy' subjects, proved immensely attractive. *Tit-Bits* was first published in Manchester, but in 1883 the headquarters were transferred to London. *Tit-Bits* was the first paper to initiate the practice of making every copy of the current issue carry with it a railway insurance policy of £100.

Tithes were originally a payment of a tenth of such things as annually increase or render an annual crop—i.e. not minerals or timber. They are divided into præ-

dial tithes—e.g. grain and fruit; mixed tithes—e.g. the young of animals, milk, etc.; and personal tithes, or gain arising from labour. They are also divided into great tithes, which are hay, corn, and wood; and small tithes, which are other prædial tithes,

the land and payable by the landlord half-yearly on January 1, and July 1. The sum paid is the amount which would purchase now a quantity of wheat, oats, or barley equal to that which could have been purchased in December 1836 with the amount then paid



Species of Tits.

1. Bearded tit (*Panurus biarmicus*). 2. Great tit (*Parus major*). 3. Crested tit (*P. cristatus*). 4. Blue tit (*P. caeruleus*). 5. Long-tailed tit (*Acredula caudata*). 6. Coal-tit (*Parus ater*). 7. Marsh tit (*P. palustris*).

and mixed and personal tithes. They were paid to the clergyman, except in extra-parochial places, where they were paid to the king. By the Tithe Commutation Acts, 1836, and the Tithe Act, 1891, nearly all tithes have been commuted into a tithe rent-charge—i.e. a sum of money charged on

for tithes. Thus the amount of the payment fluctuates, and the cost of wheat, barley, and oats is reckoned on a seven years' average. In the case of lands not yielding grain an extraordinary tithe was imposed; but in 1886 these charges were capitalized, and 4 per cent. is payable

upon them. The rent-charge may be redeemed by paying twenty-five years' purchase, by arrangement with the Board of Agriculture, and, if it exceeds twenty shillings, the consent of the bishop and patron. Tithe may be recovered in a county court, and a remission is allowed if it exceeds two-thirds of the annual value of land. Not more than two years' arrears may be re-

Tithonus, in ancient Greek mythology, a son of Laomedon, king of Troy, and brother of Priam. He was beloved by the dawn-goddess Eos, who made him her husband, and obtained for him from the gods the gift of immortality, but neglected to ask for that of eternal youth as well, so that he withered away in an ever-increasing decrepitude. The name Tithonus became proverbial

that developed steadily throughout his long life. If his colour is the expression of life itself, the creations of his mind and hand are the expression of the life of a people (the Venetians) strong, vigorous in mind and body, masterful in purpose and execution, rich, refined, cultivated. He learned from Giorgione, and carried to perfection, the warmth, pearly lustre, and elasticity of the skin seen in full beauty in the blend of northern and southern races in Venice; his men and women are strong and noble in form; to his ideal personages he gives a striking individuality. Titian was born at Pieve, in the Cadore district of the Dolomite Alps. According to Vasari, he was a pupil of Giovanni Bellini, while Dolce speaks of him as being in Gentile Bellini's studio. He became the pupil and partner of Giorgione. The major part of his life was spent in Venice, in opulent surroundings. The finest of his paintings are in Venice and in Madrid. Excellent examples are in the galleries at Rome, Florence, Dresden, Munich, the Louvre (Paris), and Edinburgh. He is well represented in private collections in England. The National Gallery has his famous *Bacchus and Ariadne*, painted for Duke Alfonso of Ferrara; *A Holy Family*; *The Repose*, with an important landscape background; *Noli Me Tangere*, an early work; and *Venus and Adonis*, probably a studio replica of an original at Madrid. See Claude Phillips's *The Early Work of Titian* (1897), and *The Later Work of Titian* (1898); Crowe and Cavalcaselle's *Life and Times of Titian* (1881); Ruskin's *Modern Painters* (1897), and *The Two Paths* (1878).

Titicaca, a lake of Bolivia and Peru, on the west side of the eastern cordillera of the Andes, at 12,500 ft. above sea-level. With Lake Aullagas, or Poopo, and its tributary streams, Titicaca forms an isolated hydrographic basin. It measures about 110 m. from N.W. to S.E., and has an average breadth of some 30 m. On the island of Titicaca are the ruins of an Inca palace and other antiquities. At the southern extremity it is drained by the Desaguadero.

Titiens, more correctly TIETJENS, TERESA CAROLINA (1831-77), operatic singer, of Hungarian parentage, was born in Hamburg, where in 1849 she made her successful debut in the character of Lucrezia in *Lucrezia Borgia*. She sang chiefly in Frankfurt and Vienna till she came to London in 1858, where she made her first appearance as Valentine in *Les Huguenots*. Her best parts were



A Painting by Titian—'La Bella del Tiziano.'
In the Pitti Gallery, Florence.

covered, and the remedy is not personal.

Tithing may originally have meant either the tenth of a hundred, or an association of ten men and their families under a tithing-man in frank-pledge. Later it became equivalent to a township, and the word is still used in this sense in Somerset, Wiltshire, and other counties. See Stubbs's *Constitutional History*.

for a decrepit old man. The story is beautifully treated in Tennyson's *Tithonus*.

Titian, properly TIZIANO VECCELLIO (1477-1576), painter of the Venetian school, and one of the greatest painters of all times. His grand, broad style, the product of a mind 'wholly realist, universal, manly,' is a harmony of fine qualities of conception, design, colour, and technique

Semiramide, Countess Almaviva, Medea, and Leonora. She was also a successful singer of sacred music. In 1876 she visited America.

Tit-lark, a common name for the meadow-pipit. See PIPIT.

Title, COVENANTS FOR. In England in a conveyance of land from a vendor to a purchaser the following covenants for title, or some of them, were formerly expressed—(1) that the vendor had a right to convey; (2) for quiet enjoyment; (3) that he had not encumbered; (4) for further assurance—i.e. that he would complete all assurances necessary to perfect the title. Such covenants are now implied by the use of certain statutory words in the conveyance.

Title Deeds are the documents, such as mortgages, conveyances, etc., which give the history of the ownership of land, and afford evidence of the holder's title. An equitable mortgage is often carried out merely by depositing title deeds with the mortgagee.

Title Guarantee Cos. See GUARANTEE ASSOCIATIONS.

Titles are distinguishing appellations belonging to persons of rank in right of birth or office, or they are assigned as a mark of respect or of courtesy. See DUKE, EARL, BARON, etc.

Titmouse. See TIT.

Titration, the process of determining the quantity of a particular component of a substance by adding a measured quantity of a solution of a reagent of known strength to it from a graduated tube or burette, the completion of the reaction being shown by a suitable indicator. For example, the quantity of sodium carbonate in a sample of the commercial product can be determined by weighing out a portion, dissolving it in water, and adding sulphuric acid of known strength, till the liquid, coloured yellow by a drop of methyl orange, turns pink. The weight of sodium carbonate present can then be calculated, from the amount of sulphuric acid used, by means of the equation $\text{Na}_2\text{CO}_3 + \text{H}_2\text{SO}_4 = \text{Na}_2\text{SO}_4 + \text{H}_2\text{O} + \text{CO}_2$.

Titular, a term applied to those who hold the title pertaining to an office without the occupation of the office itself, as in the case of the English monarchs, who assumed the title of kings of France from the time of Henry VI. to 1800. In ecclesiastical parlance, a titular is one to whom a title is granted, whether he actually fulfils the duties of the benefice to which the title belongs or not. In Scotland, laymen holding church property were called titulars.

Titus, whose full name was TITUS FLAVIUS SABINUS VESPA-

SIANUS (48-81 A.D.), Roman emperor, was the son of the emperor Vespasian. He was brought up at the court of Claudius with the emperor's son Britannicus. In his youth he served in the army in Britain and Germany, and from 66 A.D. commanded a legion under his father in the Jewish war. When Vespasian became emperor, Titus undertook the siege of Jerusalem, which was ended by the capture of the city on Sept. 8, 70 A.D. The subsequent triumph was shared by him with his father. Titus succeeded his father in 79 A.D. He abolished trials for treason against himself, and punished informers severely. His reign is rendered famous by the great eruption of Vesuvius, on Aug. 24, 79 A.D. He also completed the Colosseum and the baths called by his name. His liberality and the general charm of his character caused him to be called 'the darling of the world.' The suspicion that he was poisoned by Domitian is baseless. Tacitus, Suetonius, and Josephus are the chief authorities for his life.

Titus, a companion of St. Paul, of Gentile birth, joined the apostle at Antioch (on the first journey?), and went with him to Jerusalem, where Paul resisted the attempt to have his protégé circumcised. Titus carried probably the first, certainly the second, Epistle to the Corinthians to its destination, besides one not now extant. The Epistle to Titus found him at Crete, of which he is the traditional 'bishop.' For the epistle, see TIMOTHY, EPISTLES TO.

Titusville, city, Crawford co., Pennsylvania, U.S.A., in a rich oil region, 45 m. S.E. of Erie. Pop. (1900) 8,244.

Titios, in ancient Greek mythology, a son of Gæa, and one of the giants; he offered violence to Leto, and was killed by Zeus or by Apollo. By way of punishment in Tartarus he was stretched on the ground, while two vultures perpetually devoured his liver. See HOMER'S *Odyssey*, bk. xi.

Tiumen, or TYUMEN, tn., gov. Tobolsk, W. Siberia, 130 m. S.W. of Tobolsk, and the terminus of a railway line from Perm, has manufactures of leather, carpets, soap, and pottery. Pop. (1897) 29,651.

Tiverton, munic. bor., Devonshire, England, on the Exe, 13 m. N. of Exeter. The church of St. Peter has ancient tower and rich carvings. Of the 12th-century castle little remains. Lace is manufactured. Pop. (1901) 10,382.

Tivoli (anc. *Tibur*), old tn., prov. Rome, Italy, on the Sabine Hills, 18 m. by rail E.N.E. of Rome, at the Falls of Tevereone (Anio), which supply power for

the electric lighting of Rome. Its grapes are famous. The sulphur baths of Acque Albule, 5 m. W., attract numerous visitors. In and around the town are many interesting antiquities, as the 15th-century fortress built by Pope Pius III., the remains of Hadrian's villa, of the reputed temple of the Tiburtine Sibyl, and the Villa d'Este. In late republican and imperial times Tibur was a favourite summer resort of the citizens of Rome. Pop. (1900) 12,881.

Tlaxcala, state of Mexico, E. of Mexico state, covers an area of 1,595 sq. m., and occupies part of the central plateau, with a general elevation of over 7,000 ft. Its people were defeated by Cortes, but afterwards materially assisted him in his conquest of Mexico. Agriculture is the chief industry. The population (1900) is 172,217. Tlaxcala, the capital, lies 58 m. by rail E. of Mexico city, near the site of the ancient capital. It has a very old bishop's palace. Pop. (1900) 2,847.

Tlemcen (anc. *Pomaria*), tn., dep. Oran, Algeria, on steep mountain slope near the frontier of Morocco, 80 m. by rail S.W. of Oran. Its seaport, Rashgun, 37 m. distant, exports olive oil, grain, tobacco, cork, and ostrich feathers. Pop. (1901) 35,468.

Tlepolemus, in Greek legend, a son of Hercules; became king of Argos, but after killing his uncle Licymnius he had to flee the country. In obedience to an oracle, he settled in Rhodes, and there founded the cities of Lindos, Ialysos, and Cameirus. He joined the Greeks in the Trojan war, and was killed by Sarpedon, king of Lycia. See HOMER'S *Iliad*.

T.O., telegraph office.



Common Toad (*Bufo vulgaris*).

Toad, in the strict sense the name applicable to the members of the family Bufonidae, especially to the species of the type genus, but in combination applied to other amphibians not belonging to this family. The common toad of Britain is *Bufo vulgaris*, which has the skin of the upper parts much wrinkled and covered with the openings of numerous poison glands. The limbs are short, so that the animal is much less agile than its ally the frog; there are no teeth, and there are also certain peculiarities of the

skeleton which differentiates the toads from the frogs. The common toad is very variable, both in colour and size, the former varying with the locality, and the latter apparently with the food. In England the female toad, which is the larger, does not usually exceed three and a half inches in length, but specimens have been described from Europe whose length was six inches. Toads are nocturnal in habit, emerging from their hiding-places at dusk in search of the insects, worms, and snails which constitute their ordinary food. They are purely terrestrial in habits, and except at the pairing season do not voluntarily seek the neighbourhood of water. In spite of the popular superstition to the contrary, they are very harmless animals, being quite incapable of squirting the poison from their skin-glands. The poison does, however, exude under pressure, and in consequence dogs are very unwilling to take toads up in their mouths. Like frogs, toads hibernate during the winter. The pairing season is in the spring, and the eggs are exceedingly numerous, but are laid in long strings instead of in masses like those of the frog. The development of the young and the process of metamorphosis follow much the same course as in the frog. In parts of the British Is., especially in sandy localities in England and Wales, there occurs the natterjack (*B. calamita*), which is also found over the western parts of Europe. In this toad the skin is smooth, and the hind limbs so short that the animal cannot hop. It, however, runs well. There are a large number of other toads of this genus, many being found in S. America. Other amphibians to which the name toad is applied include the midwife toad (*Alytes obstetricus*), in which the male wraps the spawn round his hind limbs and takes care of it till the eggs hatch, and the fire-toad (*Bombinator igneus*), which has conspicuous reddish patches on the under surface of the body. Both these forms occur on the continent of Europe.

Toadflax, a genus of plants belonging to the order Scrophulariaceæ, with flowers much like those of the snapdragon, but the base of the corolla is spurred. The yellow toadflax is a common hedgerow plant, with grass-like leaves and crowded spikes of yellow flowers in late summer and autumn. The ivy-leaved toadflax is a common little wall-plant which has become naturalized in Britain. It has fleshy leaves, and bears small purple flowers during most of the year.

Toadstool. See FUNGI.

Toast, a person whose health is drunk at a banquet or other convivial entertainment. The word is also used as the call to drink such health. The origin of the custom is explained in *The Tatler*, No. 24 (June 4, 1709), from which it appears that it was the usage of the time to drink with a piece of toast at the bottom of the glass. See French's *History of Toasting* (1881).

Tobacco. When Columbus discovered America, the natives used to inhale the smoke from the dried leaves of the tobacco plant through the nostrils, by means of a forked cane, in the farther end of which was placed the burning weed. This primitive pipe was termed 'tabaco.' The custom on many of the islands was to roll the leaves so as to form a kind of cigar. Francisco Hernandez de Toledo introduced the plant to Spain from Mexico in 1559, and in the same year Jean Nicot purchased seeds from some Dutchmen in Portugal, and sent them to France. It is said that Sir John Hawkins first introduced tobacco into England, direct from America, in 1565; but the British are more indebted to Sir Walter Raleigh and Sir Francis Drake for popularizing the habit about the year 1585; and there is no doubt that Sir Walter cultivated the plant in Ireland in 1586 and following years. Then came the time of persecution. The use of the plant was prohibited at Bern, and the prohibition was even included in the Ten Commandments, while in Turkey the punishment for indulgence was death. In Russia both men and women were publicly knouted for the offence. After the period of persecution tobacco was prescribed for all kinds of complaints; while, during the 17th century, it gained renown for its disinfecting properties, and was even used in the English churches as incense. The great plague in 1665, however, gave a great impetus to the practice, smokers being considered immune. The value of tobacco as a source to the revenue, about this time, began to be realized. Nearly a century ago the Wesleyan Church prohibited its ministers from using tobacco, and this prohibition has never been repealed, although, of course, it is practically a dead letter. Two hundred years ago the consumption in Britain reached two pounds per head of the entire population per annum, but smoking among women and children was far more prevalent at that time than it is now. Then, for a time, it went out of fashion. It was given up by the gentry, and the snuff-box reigned in the place of the pipe; but early in the 19th century, when the duty on

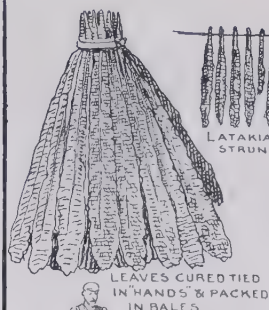
cigars was reduced, smoking again came into favour, and fifty years ago the consumption averaged one pound per head; it is now about two pounds per head. In 1868 legislation was passed providing that the railways should set apart certain carriages for the convenience of smokers. Smoking greatly increased after the Peninsular war; and the armies taking part in the Crimean war brought back with them to Western Europe a liking for the cigarette, as a result of their intercourse with the Turks.

The principal tobacco-growing region is in N. America, between 35° and 38° N. lat., and comprises the states of Kentucky, N. and S. Carolina, and Virginia. The variety there cultivated is *Nicotiana tabacum*; *Nicotiana rustica* is the kind cultivated mostly in other continents, where it provides a lighter kind of tobacco. Quite recently an interesting experiment has been made in growing tobacco under canvas; the results have been excellent, the plants attaining a greater height and the leaves being of much finer texture. The most famous tobacco-growing district in the world is, however, near Havana in Cuba. From the plants grown there are made the finest cigars procurable—cigars that fetch high prices. The leaves are carefully selected, dried, and cured on the spot, and manufactured in Havana. The tobacco grown in Turkey is of a very light and mild character. The leaves are delicate, and great care has to be exercised in handling them. This tobacco is largely used in the manufacture of Egyptian cigarettes, which are made chiefly in Cairo and Alexandria. Tobacco-growing is very largely on the increase in the Congo Free State, Mexico, Jamaica, India, and Sumatra; while, during the last few years, the supply of cigars—principally Manilas—from the Philippine Is. has decreased owing to the unsettled state of the country. Japan is making rapid strides in the cultivation of tobacco. Australia is making a great effort to grow tobacco for British consumption. Tobacco is grown very largely in Europe; Holland grows enough for its own consumption, and exports a considerable quantity to England, where it is blended with American.

In many countries it is the rule for women to smoke as well as men—e.g. in Russia, China, Siam, and the East generally. In England, however, the custom for women to smoke died out entirely, but recently, in certain circles, the practice of cigarette-smoking has been revived. In Mexico the children and teachers regularly smoke

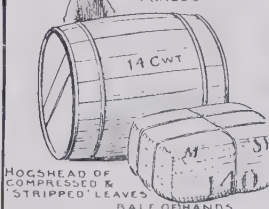


VIRGINIAN TOBACCO PLANT



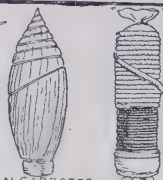
LATAKIA TOBACCO LEAVES
STRUNG ON STRING & CURED*

LEAVES CURED TIED
IN HANDS & PACKED
IN BALES



HOGSHEAD OF
COMPRESSED &
STRIPPED LEAVES

BALE OF HANDS

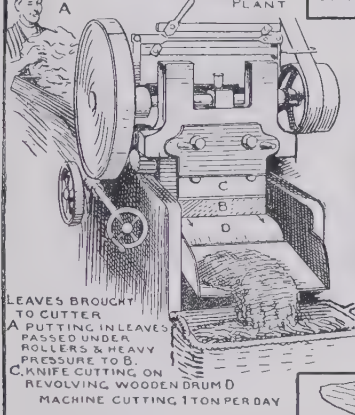


CUBAN CARROTTE
BELIQUE CARROTTE



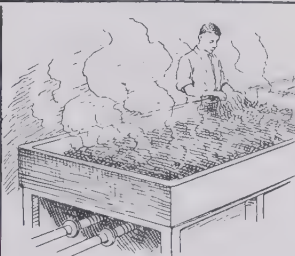
STRIPPING OUT STALKS
FROM THE DAMPED LEAVES

SORTING LEAVES
OF STRIPPED
TOBACCO

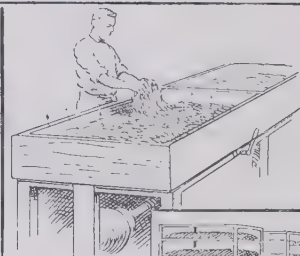


LEAVES BROUGHT
TO CUTTER
A PUTTING IN LEAVES
PASSED UNDER
ROLLERS & HEAVY
PRESSURE TO B.
C. KNIFE CUTTING ON
REVOLVING WOODEN DRUM
D MACHINE CUTTING 1 TON PER DAY

MAKING NAVY CUT

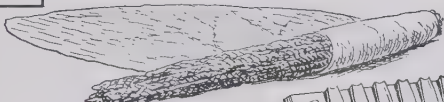


STEAM FORCED THROUGH THE
SHREDDED TOBACCO IN PERFORATED
TROUGH THEN PARTIALLY ON HOT PLATE

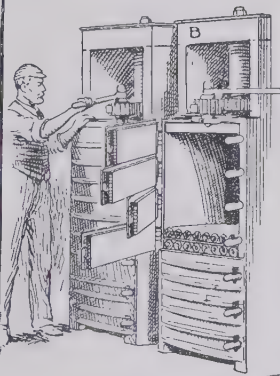


AIR BLOWN THROUGH
TOBACCO TO DRIVE
OUT STEAM.

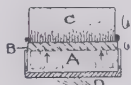
CIGAR MAKING



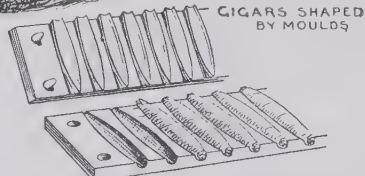
DRYING ON RACKS
& READY TO PACK.



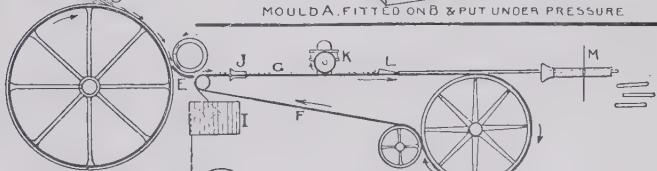
FILLING OF LEAVES COVERED WITH
TWO LAYERS OF DAMPED LEAF
ROLLED ROUND BY HAND



MOULD A, FITTED ON B & PUT UNDER PRESSURE



CIGARS SHAPED
BY MOULDS



PLAN OF CIGARETTE MACHINE MAKING 300 PER MINUTE
A TOBACCO ON SLOPING TRAY. B FEED ROLLER. C DRUM
COMBING TOBACCO. D PASSED TO TOP OF GROOVED WHEEL
E GUIDE TO ENDLESS BAND F G TOBACCO ON PAPER
& BAND. H MILE OF CIGARETTE PAPER. I PRINTING
NAME. J GUIDE CURVING UPSIDES OF BAND. K WHEEL
PASTING PAPER. L FOLDER. M CIRCULAR CUTTER

SKETCHES BY MESSRS R. & J. HILL'S, SHOREDITCH.

in school, and during the progress of the great plague of London (1665) the children were taught to smoke in order that the scourge might not affect them. In Canada and most of the states in N. America it is a penal offence to sell tobacco to any child under the age of sixteen, and a similar enactment has been passed (1902) by the House of Keys in the Isle of Man.

The ordinary method of cultivation requires a great amount of skilled attention. The seed beds occupy a different situation each year, and the sowing takes place early in the year, so that the seedlings may be planted out before the end of May. The plants thrive best in a gray gravel soil, and are placed about three feet apart. Each acre of ground requires from 400 to 500 lbs. of good fertilizing material. Each plant is allowed to bear about twelve leaves, which will make half a pound of tobacco, the leaves being about two and a half feet long and one foot wide. To bring about this result the plants must be topped at the right time, and all buds and shoots must be picked off in order that all the nourishment may be directed to the leaves. During September, the ripper leaves are gathered, or more generally the whole plant is cut down, left in the sun for a day, and then hung over sticks, and placed in a barn in which a smouldering fire regulates the heat (from 70° to 80° F.). The leaves are then placed in a heap, covered with matting, and allowed to 'sweat' for about six or eight weeks, being turned every day to ensure equable curing. They are then tied in 'hands' or bundles of half a dozen leaves and stocked. Fermentation is induced by means of cider or other dressings, about the composition of which much secrecy is observed. The hands are then dried and packed in hogsheads, each containing about 1,000 lbs., and are ready for shipment.

It is probable that the flavour of tobacco is caused by bacteria. (See *Contemporary Review*, July 1899.) When the dry leaves reach the factory, they are wetted in order that they may be softened and separated. The central stem of each leaf is then removed, and the leaf strips carried to a machine, where they are cut into very fine shreds, which are afterwards dried in shallow pans. 'Shag' is prepared in this manner; but for 'bird's eye' the central stem is left in. For other kinds, the tobacco, after being moistened, is pressed by hydraulic power into cakes, and then cut into thin flakes, largely known under the titles of 'navy cut,' 'plug,' 'twist,' 'Irish roll,' and

so forth. Great experience is needed in blending tobaccos, so as always to obtain the same flavouring and appearance. Sumatran tobacco, which is practically without aroma, and is used solely for covering cigars, is treated somewhat differently. On being cut, the leaves are hung in temporary sheds to dry, then roughly classified, and sent into the permanent fermenting shed. There they are carefully built into 'staples,' increasing in size as fermentation takes place. No dressing of any sort is necessary to induce the heat, which is generated entirely by the decay of the leaves. After another exhaustive classification or 'sorting,' the tobacco is carefully baled and shipped to Holland.

Snuff is composed principally of the central stem of the tobacco leaf ground into fine powder, and flavoured with various scents and spices.

The quality of tobacco varies considerably from year to year, especially in the districts which produce tobacco for cigars, in the same way as vintages. Adulteration is practically an impossibility at the present day in connection with British manufactured tobaccos, as all factories are under the strict inspection of the excise officers. The percentage of oil and moisture in the finished product is strictly regulated by government. In imported tobaccos, especially those coming under the head of cavenish, there is, at times, a considerable admixture of sugar, liquorice, or sweetening compounds, and in imported cigarettes there may be a certain amount of glycerin.

The attempt of the Consolidated Tobacco Company, an American trust, to capture the tobacco trade of the United Kingdom in 1901, ended in failure. See *Histoire, Géographique, Statistique du Tabac*, by O. Comes (1900); and *The Sovereign Herbe, a History of Tobacco*, by W. A. Penn (1900). The standard work on the subject for many years was *Tobacco, its History and Associations*, by Fairholt (1859).

Tobago, isl. of W. Indies, 70 m. S.E. of Grenada, has an area of 114 sq. m. It has a remarkably healthy climate, and is politically and commercially connected with Trinidad. Scarborough is the chief town. Pop. (1901) 18,750.

Tobas, South American aborigines, a fierce and lawless people, who still maintain their independence about the Pilcomayo R. in Argentina and Paraguay. They form the chief obstacle to progress in Gran Chaco. In 1882 the Tobas massacred Crevaux and his followers, who were attempt-

ing to open the Pilcomayo route between Bolivia and Paraguay. The national name is Pitilaga, Toba being the Guarani word. The Tobas, who are exclusively hunters, have a very low type of skull, and are unable to count beyond five.

Tobermory, coast vil., cap. of Mull, Argyllshire, Scotland, was founded in 1788. It has two quays. Within a few yards of the shore the *Almirante de Florencia*, a treasure ship of the Spanish Armada, was blown up in 1588. Many early attempts were made to recover the buried treasure, but without success. Divers with modern appliances have been at work since 1904, but little of value has been recovered. Pop. (1901) 1,175.

Tobit, BOOK OF, one of the books of the Old Testament Apocrypha, narrates how Tobit, a pious Jew of the tribe of Naphtali, while a captive at Nineveh, fell into disfavour by his custom of burying the bodies of his murdered countrymen, and was thereafter unfortunate enough to lose his eyesight through an accident. He sent his son Tobias to Rhagæ in Media, in order to recover a loan made to a compatriot there; and while on his way thither, accompanied by Azarias (really the archangel Raphael), Tobias killed a monster fish in the Tigris, preserving its heart, liver, and gall. At Ecbatana he married his cousin Sara, daughter of Raguel. During the marriage festivities Azarias brings the money from Rhagæ, and the three return to Nineveh, where Tobit's sight is forthwith restored by means of the fish's gall. The book closes with thanksgivings to God, the blessings of Tobit, his death, and the removal of Tobias to Media. The original is believed by some to be Hebrew, by others Greek, while several scholars decide for Aramaic. See APOCRYPHA; Fuller, in *Speaker's Com.* (1888), and Scholz (1889).

Tobler, ADOLF (1835), Romance philologist, was born at Hirzel, in the canton of Zürich. After studying under Diez at Bonn, he, in 1867, was called to the chair of Romance philology at Berlin. There he has founded a school of distinguished Romance scholars. He has edited various early French and Italian texts, and dealt with historical French metre and syntax. He has also contributed innumerable articles, reviews, and papers to the *Göttinger Gelehrte Anzeigen*, *Zeitschrift für rom. Phil.*, *Archiv für das Studium d. neueren Sprachen*, *Archivio Glottologico*, and the *Transactions of the Berlin Academy*. An Old French dictionary on the most elaborate scale has occupied Tobler during the greater part of his life.

Tobogganing. Switzerland is for Englishmen the home of tobogganing, and it is there the sport is most highly developed. The type of machine used by the Swiss country people is intended for only one passenger, and consists of a light framework, supported about five inches from the ground by wooden runners, turned up at the end and shod with steel. The rider sits on this, and steers with his heels in front. Tobogganning as an organized sport is carried on either on a made run or on an ordinary post road. The most famous run made in Switzerland, and the most difficult in the world, is the Cresta at St. Moritz. No section of the course is actually straight, no two gradients are alike. Its length is 1,400 yds., with a drop of 500 ft. The distance has been covered in 1 min. 3½ secs. The great race there is called the Grand National, and is open to the world, on any machine. The form of toboggan now used consists of two round bars of three-quarter-inch steel, as runners, secured to a board thirteen inches wide. The rider lies face downwards and steers with his toe. These machines are known as 'skeletons' or 'giant skeletons,' according to their size. The most famous Swiss road-racing is carried on the ordinary post road from Klosters to Davos Platz. It is 200 ft. short of 2 m. long, and the drop is 800 ft. The two great events at Davos are the International, which is open to all comers on any machine, and the Symond's Shield, open to all comers on the machine of the country. To negotiate a corner at high speed requires considerable skill and experience. The record time is 4 min. 47 sec., done by M. B. Dwyer. This time, however, is quite exceptional, 5 min. 40 sec. being the usual record. A more sociable form of sport indulged in on roads is bob-sleighing. A bob-sleigh is intended for two or more, and consists of a long board supported on two skeleton toboggans, the front one of which can be turned by two handles. Tobogganing is an important winter amusement in Canada, the United States, and Russia. The Canadian and American runs are made ice-roads, usually straight, and about 1,000 ft. long, with a drop of 120 ft. Their drawback from a sporting point of view is that they are too easy. There are usually two or three parallel roads in each chute. The finish may be either in soft snow or hay, or best of all, as at Kingstons, in a frozen lake. The run at Orange, New Jersey, about 1,000 ft., has been done in 9 sec. Tobogganing in Russia was a

mode of conveyance long before it was a sport. The Russian slides are quite exceptional in having alternate rises and falls. See Henry Gibson's *Tobogganing on Crooked Runs* (1887), T. A. Cook's *Notes on Tobogganing at St. Moritz* (1896), and the *Encyclopædia of Sport*.

Tobolsk. (1.) Government, W. Siberia, extends from the government of the steppes to the Gulf of Ob and the Yalmal peninsula. It is drained by the Ob and its tributary the Ishim, which flow through a vast alluvial basin of low elevation, sloping very slightly towards the Arctic Ocean. The south-western districts have a fruitful black soil and a comparatively favourable climate, and only 35 per cent. of the area is covered with forest. Here grain can be grown successfully. The south-eastern corner extends into the Baraba steppe, where the soil is also fruitful but marshy, the climate more severe, and numerous insects torture man and beast. The central part of the government is occupied by dense forests, full of pools and marshes; while to the N., in the Berezov district, tundra stretches to the shore of the ocean. The Ostiaks dwell in the central part of the government, and maintain themselves by fishing and hunting. In the extreme N. are Samoyedes, and Voguls on the slopes of the Urals. The first conquests of the Russians were made in this region when the Cossack Yermak crossed the Urals in 1581. The Siberian railway skirts the southern border. Area, 539,659 sq. m. Pop. (1897) 1,438,484. (2.) Town, cap. of above gov., on the r. bk. of the Irtysh, opposite the mouth of the Tobol. Part of the town is situated on the low unhealthy ground by the river, the other part on a conspicuous bluff. The latter contains the kremlin, the cathedral, the prisons, the monument to Yermak, the residences of the governor and of the archbishop of Tobolsk and Siberia. Tobolsk was founded in 1587. Pop. (1897) 21,401.

Toboso, tn., La Mancha, New Castile, Spain, 60 m. E.S.E. of Toledo; was immortalized by Cervantes as the home of Dulcinea in *Don Quixote*.

Tocantins. See AMAZONS, PERU.

Toccatto, the title of one of the earliest forms of solo compositions for keyboard instruments. Its form is somewhat indefinite, but its music is always of a brilliant nature, and demands for its adequate performance great facility of execution and delicacy of touch.

Tocqueville, CHARLES ALEXIS HENRI MAURICE CLÉREL DE (1805-59), French writer, was born

at Verneuil (Seine-et-Oise). In 1830 Tocqueville visited America, where he made an eager study of democratic institutions, and in 1835 published the first two volumes of his *Démocratie en Amérique*, a work which had an immediate and world-wide success. The remaining two volumes followed in 1840; but in the previous year Tocqueville became deputy for Valognes in Normandy. He declined to support the government of Louis Philippe, and remained in opposition till 1848, when he was made a member of the committee which framed the constitution of the second republic. In 1849 he held, for a short time, the portfolio of foreign affairs; but after the *coup d'état* of 1851 he retired into the country. In 1856 appeared his second great work, *L'Ancien Régime et la Révolution*, a study intended to show the true relationship between the past and the present in France. It is, like its predecessor, a criticism, not a history, and stamps its author as a luminous intelligence rather than as a constructive statesman. See *Memoir and Letters* (trans. by Beaumont, 1860-5); Introductory Notice by Reeve, prefixed to trans. of *Démocratie en Amérique* (1835).

Todas, a pastoral tribe of the Nilgiri uplands, S. India, noted for their peculiar social usages and fine physique, with very full beard and regular, almost European features. They speak a rude dialect of the Kanarese Dravidian language, and traditionally migrated from the Kanara coast district in the 12th century. Pop. (1901) 805.

Toddy, an intoxicating beverage obtained by drawing off the sap of several varieties of palms, especially the coconut palm. A rapid, spontaneous fermentation, lasting scarcely a day, gives the toddy. This when distilled yields arrack. Whisky and boiling water, with or without sugar and a slice of lemon, is known in Scotland as toddy.

Todea, a genus of ferns, mostly natives of New Zealand and Australia. They have much the habit of polypodies, and are easily grown in a cool greenhouse, or even in sheltered moist places in the open. They like a soil containing plenty of sand and peat, and shade and moisture are requisite for success.

Todhunter, ISAAC (1820-84), English mathematician, was born at Rye. He was senior wrangler at Cambridge, fellow of St. John's College (1849), and F.R.S. (1862). Todhunter was the compiler of the standard *Euclid* (1862), his other treatises on *Algebra* (1858), *Trigonometry* (1859), *Mechanics* (1867), and *Mensuration* (1869) being



Tobogganing.

1. Tobogganing in Canada. 2. The 'Flying Dutchman' bob-sleigh passing Horseshoe Corner, St. Moritz, on its record course. 3. Park Slide, Montreal. 4. 'Boule de Neige,' winner of Bob-sleigh Derby, St. Moritz, 1904. 5. Full speed round a corner of the new track, St. Moritz. (Photos 1 and 3 by Notman, Montreal; 2, 4, and 5 by Ballance, St. Moritz.)

also widely known. Todhunter was also an accomplished linguist and student of philosophy. See Professor J. E. B. Mayor's *In Memoriam* (1884).

Todhunter, JOHN (1839), Irish physician and author, was born in Dublin, and won the chancellor's English verse prize at the university three years in succession (1864, 1865, and 1866). After practising medicine at Dublin, he was appointed professor of English literature at the Alexandra College in 1870, and held the post till 1874. After travelling on the Continent and in the East, he settled in London. He has published several books of verse and prose, and has perhaps put his best work into his dramas, which, besides two plays on Greek subjects—*Helena in Troas* (1886) and *A Sicilian Idyll* (1890)—include *The Poison Flower* (1891), *The Black Cat* (1893), and *A Comedy of Sighs* (1894). The now defunct Independent Theatre owed a good deal to him.

Tödi, a group of Alpine peaks, between the Vorder Rhine valley (canton of Grisons) and those of the Linth (canton of Glarus) and the Reuss (canton of Uri). It culminates in the peak of Tödi (11,887 ft.), conspicuous from Zürich. Its chief passes are the Planura (9,646 ft.), Sand (9,121 ft.), Panixer (7,897 ft.), and Kreuzli (7,710 ft.). See Coolidge's *Range of the Tödi* (1894), in the Climbers' Guides Series.

Todi, JACOPONE DA. See JACOPONE DA TODI.

Todleben, FRANZ EDUARD IVANOVICH (1818–84), Russian general, born at Mitau in Courland; served against Shamyl in the Caucasus (1843–51), and distinguished himself in the Crimean campaign, where the fortifications he erected at Sebastopol resisted the attacks of the allied armies for 349 days. In 1877, during the Russo-Turkish war, he conducted the siege of Plevna. He wrote an able work describing the defence of Sebastopol (1864–72). See *Lives*, in French by Brialmont (1884), and in German by Krämer (1888).

Todmorden, munic. bor., W. Riding, Yorks, England, 12 m. W. of Halifax; with cotton spinning, weaving, dyeing, and machinery manufacture. Pop. (1901) 25,419.

Tofana. See AQUA TOFANA.

Toga, the chief and distinctive garment of the ancient Romans. It consisted of a large piece of cloth, of a semicircular shape, the straight side being four or five yards in length, and the width about two yards. It was put on with the straight edge hanging over the left shoulder and arm in front down to the feet; the part then hanging behind the back was brought round

under the right shoulder, and thrown over the left shoulder, with the end hanging down the back. Over the right leg the toga was folded over, the fold being used for carrying light articles. The usual colour was white, its material being wool. In mourning, a toga of black wool was worn. The *toga picta*, which was embroidered, was worn by generals when celebrating a triumph. The *toga pretexta*, with a broad purple border, was worn by magistrates and priests, and also by children. At the age of seventeen youths gave up the *toga pretexta*. The Roman emperors wore a toga which was wholly of a purple colour. The toga was not allowed to be worn by foreigners or slaves. Under the empire its use went out, except on formal occasions, and lighter and less cumbersome garments took its place.



Roman Toga.

Togo, HEIHACHIRO, Japanese admiral (1857), born at Kagoshima. In 1873 he was sent to England, where he served on board H.M.S. *Worcester*, and studied at the Thames Nautical College, Greenwich. In 1894, when the Sino-Japanese war broke out, he received a captain's commission, and took part successfully in one of the first engagements, and before the end of the war (1895) he had attained the rank of vice-admiral. In the Russo-Japanese war (1904–5), he was in command of the Japanese fleet. His principal exploits were the bombardment of Port Arthur, the heroic attempt to blockade the fairway by means of sunken ships, the pursuit and defeat of the Port Arthur fleet, the sinking of two of the enemy's ships, and finally the complete destruction of Rozhdestvensky's fleet at the battle of Tsushima in the Sea of Japan (May 27, 1905). He received the Order of Merit at the hands of Prince Arthur of Connaught in February 1906.

Togoland, German protectorate (since 1884), Upper Guinea, W. Africa, between French Da-

homey on the E. and British Gold Coast on the W.; covers an area of 33,000 sq. m., and extends inland as far as 11° N. The Mona and the Volta form the E. and W. boundaries respectively for a considerable part of their courses. The coast-land has numerous lagoons, and is unhealthy; the interior is mountainous. The chief seaport, Lome, is the residence of the commissioner. The exports include palm kernels, palm oil, rubber, and gum. The total trade is under half a million sterling annually. Pop. 1,500,000, chiefly Ewe negroes.

Tokat, tn., vilayet of Sivas, Asia Minor, 52 m. N.N.W. of Sivas; has manufactures of copper ware and leather. It was the scene of an Armenian massacre in November 1895. Pop. (1901) 30,000.

Tokay, tn., Zemplén co., Hungary, at confluence of Bodrog and Theiss, 30 m. E. of Miskolcz; is celebrated for its white wines. Pop. (1901) 5,110. The imperial tokays are liqueur wines of choicest quality, possessing a luscious flavour, grand bouquet, lovely perfume, and from 10 to 12 per cent. of alcohol. Tokay essence is the finest wine, while the *ausbruch* is somewhat inferior to it. Nearly the whole of the genuine wine is bought up in Hungary, and little reaches the outer world.

Token, a coin the currency value of which is greater than its metal value. Numismatically it is money of necessity, issued by reason of the scarcity of regal coins. To the time of James I. shopkeepers and others struck farthing tokens in lead. In 1613 Lord Harrington was empowered to make farthing tokens of copper. In 1648 traders began to issue their tokens in copper or brass. Between 1784 and 1797 hundreds of tons of tokens were circulated as currency. Of finer design than the regal coin, they were much sought after by collectors, and large quantities were struck for sale to numismatists. These tokens were superseded as currency by the twopenny and penny pieces issued by the government in 1797. In 1795 private tokens were first issued; these are very rare, as only a few of each were struck. In 1804 the Bank of England issued recoined Spanish dollars for five shillings, and in 1811 to 1816 silver tokens for three shillings, and one shilling and sixpence. The Bank of Ireland issued tokens for six shillings, thirtypence, tenpence, and fivepence. The overseers of the poor issued copper tokens for one penny and threepence, and silver tokens for sixpence and one shilling. Tokens were formerly extensively used in the Scottish churches as passes to the communion table.

Tökölý, IMRE (1656-1705), Hungarian leader, born at Késmárk. At the age of twenty-one he was elected leader of the Hungarian Protestant insurgents, who had risen against the Emperor Leopold I. in defence of their privileges, and by 1681 had conquered the whole of upper Hungary. The Porte proclaimed him king of Hungary—a title he never accepted. Forced to lean upon the Turks, he assisted them in 1683 when they invaded Hungary and Austria, only to be beaten back from the walls of Vienna by Sobieski, king of Poland. Tökölý's conditions of peace being meanwhile rejected by Leopold, the war was resumed with varying success till Tökölý was seized (1685) by the Turks, and sent a prisoner to Constantinople for negotiating independently with the common foe. In 1686, and again in 1690, Tökölý invaded Hungary with Turkish auxiliaries, won the battle of Zernest (1689), and the same year was elected prince of Transylvania; but after the battle of Zenta (1696) he took refuge in Turkey. He and his adherents were excluded from the benefits of the peace of Carlowitz (1699) and outlawed; whereupon he resided at Constantinople, on the bounty of the Sultan.



Environs of Tokyo.

Tokyo, formerly YEDO or JEDDO, cap. of Japan, is situated at the N. extremity of the landlocked Bay of Yedo or Tokyo. Tokyo means 'Eastern Capital,' and received that name in 1868, when the Mikado took up his residence there. Its importance dates from 1590, when it fell into

the hands of Iyeyasu, who in 1603 became Shogun, and made it his capital. Large vessels lie 5 or 6 m. from the city, and the trade is conducted at Yokohama, 18 m. distant by railway. The Mikado's palace occupies a central position on the site of the former Shogun's castle. It is surrounded by deeply excavated moats, planted with trees, which, with the remains of the old parapets, turrets, and gates, give this part of the city a picturesque appearance. Round the palace, on the higher grounds, are the official quarter and European buildings, constructed on the sites of the mansions of the former Daimios and their retainers. On the high ground to the N. stand the imperial university and the Russian cathedral. The commercial city stands on lower ground, reclaimed from the sea and the marshes. It still consists chiefly of wooden houses, and is subject to frequent and destructive fires. Part, however, is now more solidly constructed in brick. There are several parks, and many gardens and sheets of water. The old conduits have recently been replaced by a more effective system of water supply. Pop. (1903) 1,818,655.

Toland, JOHN (1670-1722), Irish theologian, was born in Co. Londonderry. Although brought up as a Roman Catholic, he embraced Protestantism, and afterwards published several works of a strong deistical tendency. In 1707-10 he made a continental tour, but in his later years sank to the position of a semi-political hack writer, dependent on the patronage of Harley, Shaftesbury, and others. Besides many pamphlets, he wrote *Christianity not Mysterious* (1696), *Nazarenus* (1718), *Life of Milton* (1698), and *Account of Prussia and Hanover* (1705). See his *Life* by Des Maiseaux (1747).

Toledo. (1.) Province, Spain, in valley of Tagus, and on mountain slopes on S. and N. Agriculture and pasture, and some silk, cloth, and flannel weaving, are the main industries. Area, 5,919 sq. m. Pop. (1901) 376,814. (2.) City, cap. of above prov., 56 m. S.S.W. of Madrid, is a romantic Moorish walled city, on an imposing eminence over the Tagus. It was the capital of Gothic Spain, and of an independent kingdom under the Moors. It was captured by Alfonso VI., and made the Christian capital in 1085. Its superb Gothic cathedral is only rivalled in Spain by that of Burgos, and its Moorish and Mudéjar remains are of the highest interest. Its swords were once famous throughout the world, and a large trade

in steel cutlery is still carried on, as well as some cloth-weaving. Pop. (1901) 23,317. (3.) City, Ohio, U.S.A., co. seat of Lucas co., near the head of Lake Erie, at the mouth of the Maumee R. It has a large traffic on the great lakes. The leading manufactured products are flour, foundry and machine-shop products, malt liquors, and lumber. Pop. (1900) 131,822.

Toledoth Jeshu, or 'Generations of Jesus,' professes to be the *Life of Christ*. It is, however, a Jewish lampoon of the middle ages, the outcome of the hatred which the Jews felt towards their Christian oppressors. The best edition was published in a Latin translation by Wagen-seil in 1681.

Tolentino (anc. *Tolentum*), tn., Macerata prov., Italy, 36 m. S.S.W. of Ancona; has manufactures of silks, woollen goods, and wine. Its cathedral and churches are architecturally interesting. Here, in February 1797, was signed the treaty between Pope Pius VI. and Napoleon Bonaparte; and on May 2 and 3, 1815, the Neapolitans under Murat were defeated by the Austrians. Pop. (1901) 13,197.

Toleration, in religious matters, is a modern growth. The reformers were conscientious persecutors; Calvin's treatment of Servetus is a case in point. The Presbyterians, in England and Scotland alike, insisted on conformity of the minority to their views; and even the Independents had no toleration for 'prelacy.' The Puritan fathers in America practised unflinchingly the intolerance which had driven them forth from England. The Act of Toleration passed in England by William III. repealed the acts of Charles II. against conventicles, and gave a working liberty to Protestant dissenters and Quakers. Roman Catholics were excluded, mainly for political reasons; and anti-Trinitarians, as subversive of the principles of Christianity. Statutes are still in force in Britain against breaches of the Sabbath and against blasphemy.

Tollens, HENDRIK CAROLUS-ZOON (1780-1856), Dutch poet, born in Rotterdam, was engaged in mercantile pursuits until 1846. He was the most popular Dutch poet of the 19th century, and wrote the comedies *De Bruijloft* (1799) and *Gierigheid en Baatzucht* (1801); the tragedy *Konstantijn*; poems—*Idyllen en Minnezangen* (1801-5), *Gedichten* (1808-15), *Romanzen, Balladen, en Legendes* (1818), *Nieuwe Gedichten* (1821), *Versterioode Gedichten* (1840), and *Laatste Gedichten* (1848-53). His *Verzamelde Werken* appeared at Leeuwarden (1876).



Views in Tokyo.

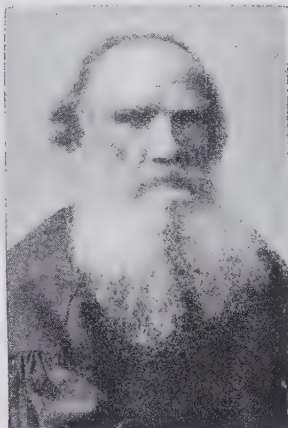
1. Asakusa Temple, interior. 2. General view. 3. Scene on a canal. 4. Ikegami Pagoda. 5. The Ginza, the chief commercial thoroughfare. 6. Wisteria at Kameido. 7. Asakusa Temple, exterior. (Photos 2, 3, and 5 by Underwood & Underwood.)

Tolls and Tollage. The right to levy tolls is acquired (1) by statute—for example, bridges and railways are built subject to a right created by Act of Parliament in the builders to levy toll; (2) by grant or franchise; (3) by prescription or implied grant. Thus tolls for ferries, bridges, markets, anchorage, etc., may be created by a grant from the crown; but even then a toll must not be unreasonable either in nature or amount. A right to take toll will not generally be presumed from long usage unless the payee gives the payer some benefit—e.g. keeps a bridge in repair or erects stalls in a market. Stallage is a toll for a stall; picaage, a toll for breaking ground, as, for instance, to erect a booth at a fair; toll-traverse is a toll for crossing private land; toll-thorough, a toll for passing through a town. Kings, persons attending funerals or church, and some others, are exempt from franchise tolls. Turnpike tolls were collected by turnpike trustees, but they are now in almost all cases obsolete. Tolls on roads were abolished throughout Scotland by the Roads and Bridges Act, 1878, which came into force in 1883, wherever it had not been already adopted.

Tolosa, tn., prov. Guipuzcoa, Spain, 16 m. s. of San Sebastian; ancient capital of the province; with paper-making, tanning, and iron-founding. Pop. (1901) 8,111.

Tolstoi, COUNT LYOV NIKOLAIEVITCH (1823), Russian novelist, was born at Yasnaya Poliana in the government of Tula. In 1851 he joined the army in the Caucasus as a volunteer, and it was at this time that he wrote *Childhood* and *Boyhood*, besides preparing the plan of *The Cossacks*. In 1853, whilst engaged in the Crimea, he found time to write *Sevastopol*, a series of remarkable war sketches. It was when he was sent with dispatches to St. Petersburg to announce the fall of Sebastopol that he met Turgenev, and while the relations between the two great writers were never cordial, and sometimes bitterly strained, it is pleasant to know that when the latter was dying he spoke with warm regard of 'Lyov Nikolaievitch.' About the end of 1857 Tolstoi began to turn his attention to agriculture and the management of his estate. In 1863 he began what was to prove one of the greatest of his works, *War and Peace*. In this novel Tolstoi deals with the condition of Russian society in the momentous period of 1805 to 1815, and as the work became known, it won for its author a high place in the world of letters. About 1871 he began *Anna Karenina*, his second greatest

work, and one which, like *War and Peace*, while ostensibly dealing with the condition of society, represents in an unmistakable manner the writer's own mental experience. In 1880, after a severe spiritual experience, appeared *My Confession*; and from that time onwards, until a decree of excommunication was published against him by the Holy Synod in 1901, his attitude towards the Church was that of a socialistic iconoclast. In 1885 *My Religion* was produced, and it was followed in 1889 by the *Kreutzer Sonata*. The latter work deals with the sordidness of social conditions, and is typical of the morbid subjectivity that runs through all Tolstoi's writings. In 1895 his socialistic tendencies found practical expression, when he voluntarily renounced his property in copyright, land, and money, and having divested himself of his



Count Lyov Nikolaievitch Tolstoi.

estate, which he was prevailed upon to make over in favour of his wife, he thereafter continued to live the life of an ordinary peasant on the land. Among Tolstoi's other works may be mentioned *Resurrection*, *The Kingdom of God is within You*, *Master and Man*, *Ivan Ilyitch*, *What is Religion?* and *The End of the Age*, all more or less of a strongly didactic and pessimistic nature. The universality of his preaching is too wide to place him in the list of propagandists, and his flight is too near the earth to entitle him to be regarded as the exponent of any new faith. His attitude of mind is altruistic and beneficent, but its want of philosophic sanity militates against its expression being authoritative. As a writer he is intensely realistic and full of interest. His *Works* were

translated into English by N. H. Dole (1889-90), in 19 vols. See Wiener's *Count Tolstoi's latest Works, Life* (1905); C. E. Turner's *Count Tolstoi as Novelist and Thinker* (1888); *Life* in German by Loewenfeld (1892); Knowlson's *Leo Tolstoi* (1904); Birukoff's *Early Life of Leo Tolstoi* (1905); and *Tolstoi, his Life and Work* (vol. i. 1906).

Toltecs, a prehistoric people of Mexico and Central America, to whom the Aztecs and the Mayas ascribed all their arts and all ancient monuments the origin of which was unknown. By some writers, however, the Toltecs are regarded as a fabulous people who never existed. Some light has been thrown on this obscure subject by the recent researches of Seler and Förstemann. Seler's German commentaries have been translated into English by A. H. Keane (1901-2). See AZTECS.

Tolu Balsam. See BALSAM.

Toluca, tn., Mexico, cap. of state of Mexico, 36 m. w.s.w. of Mexico city. It is a fine town, with cotton mills and breweries. To the south rises the Nevado de Toluca, a mountain (14,950 ft. high). Pop. (1900) 25,900.

Toluene, $C_6H_5CH_3$, a colourless liquid that closely resembles benzene in its properties, but boils at a higher temperature—namely, $110^\circ C$. It is obtained by distilling coal tar, and is used as a solvent, and also for the preparation of benzoic acid, dyes, and aromatic derivatives.

Toluidine, or METHYL-ANILINE, $C_6H_4(CH_3)NH_2$, exists in ortho-, meta-, and para- varieties, and occurs in coal tar. It is prepared commercially with aniline by the reduction of the nitro-toluenes that are mixed with crude nitrobenzene, the commercial 'aniline for red' and 'toluidine' being mixtures of aniline, ortho- and para- toluidines. Ortho- (b.p. $199^\circ C$.) and meta- (b.p. $202^\circ C$.) toluidines are liquids closely resembling aniline, while paratoluidine is a solid (m.p. $42.5^\circ C$.). The first and third are employed in the manufacture of rosaniline and other dyes. See ANILINE.

Tomahawk, the war-club of the North American Indians, with a head of stone, attached by thongs. Tomahawks were not only used as weapons of war in hand-to-hand conflicts, but for throwing at an enemy. Steel tomahawks were subsequently introduced by Europeans, and made so as to serve as tobacco pipes, the handle forming the stem.

Tomaszow, or TOMASZOW, tn., Piotrkow gov., Russian Poland, 15 m. N.E. of Piotrkow tn.; with cloth and cotton manufactures, dye works, iron works, blast-furnaces, worsted mills, and iron mines. Pop. (1897) 21,041.

Tomato (*Lycopersicum esculentum*), a South American annual plant belonging to the order Solanaceae. It is very largely cultivated in Britain for its fruit, mostly under glass, though in favourable localities, or under south walls, it can be grown in the open air. Under glass, if a night temperature of 60° can be afforded, tomatoes may be had all the year round. They may be grown in beds, pots, and boxes; but in any case plenty of light is essential. They may be propagated by seeds or cuttings.



Tomato.

1, Flower; 2, calyx and pistil; 3, fruit; 4, section of fruit.

Tomb, a sepulchre, whether a structure raised above ground or a subterranean vault or pit. In Assyria and Egypt, as in other parts of the East, pyramidal tombs were long in vogue. Pyramids are specially associated with Egyptian sepulchre. Nevertheless, the earliest kind of tomb in Egypt was a round, shallow grave, in which the body was placed on its side, with the knees drawn up toward the chin, as in Eskimo burials. Later, the body was enclosed in a wooden or an earthenware coffin, and this was placed in a bricked recess, out of which was eventually evolved the main sepulchral chamber, with subsidiary 'store chambers,' exemplified by the royal tombs of the first dynasty at Abydos. Another variety of ancient Egyptian tomb is the quadrangular stone building called a *mastaba*; and there is also the hybrid mastabapyramid. Then, again, there are tombs, such as those at Hermopolis (Beni-Hassan), at Thebes, and at Assouan, which were cut out of the solid rock, forming groups of catacombs, the prototypes of those at Rome, Naples, and other parts of Italy. The use of rock sepulchres was adopted from the Egyptians by the He-

brews, who also in many cases buried their dead in graves. Mausoleums, which derive their name from the tomb of Mausolus at Halicarnassus in Asia Minor (erected 353 B.C.), are buildings surmounted by a dome or a pyramid, and are usually of Greek or Roman architectural style. The most beautiful of all mausoleums is the Indo-Saracenic Taj Mahal at Agra, built in the middle of the 17th century by the Mogul emperor Shah Jehan, for himself and his wife. In China, excavated graves of horse-shoe outline, with stone lining, are common; but the spirits of the dead are commemorated by ancestral tablets, placed in temples and houses. The huge mound sepulchres of the Japanese Mikados are noticed under TUMULUS. Their architectural connection with the pre-Aryan tombs of Greece is obvious. For the latter are tumuli or underground chambers, vaulted by means of the cyclopean or Pelasgic arch, and approached by an underground passage of like character. The tombs of ancient Etruria have been described by Sir Richard F. Burton, and they are very numerous. 'Four hundred tombs,' he states (*Etruscan Bologna*, 1876, p. 22), 'were opened in four years. All the skeletons lay supine; only six were irregularly disposed, probably facing their homes. All the rest were oriented, with their feet towards the rising sun.'

Tombac, a kind of brass, containing 86 per cent. of copper and 14 per cent. of zinc.

Tombigbee. See MOBILE (2).

Tom, a colony from Miletus, founded perhaps about 600 B.C., on the W. coast of the Black Sea, about 100 m. S. of the mouth of the Danube. Ovid was exiled here by Augustus. After the reign of Trajan it became a thriving mercantile community. Its modern name is Constanza (Kostantia).

Tomkins, DANIEL D. (1774-1825), vice-president of the United States, born at Scarsdale, Westchester co., New York; became a barrister in New York, was elected to the legislature (1801), a member of Congress (1804), judge of the supreme court (1804), and governor of the state (1807-17). He became vice-president of the United States (1816) on the Monroe ticket, and was re-elected (1820).

Tommaso, NICCOLO (1802-74), Italian man of letters and politician, was born at Sebenico (Dalmatia), and began his literary career as a writer on the Florentine *Antologia*. When this paper was suppressed (1834) he fled to Paris, and on returning to Italy (Venice) he was imprisoned till the March revolution of 1848.

He then became a member of the provisional government. Soon political changes again forced him to seek refuge in Corfu, where he wrote the powerful *Supplizio d'un Italiano*, which made a great impression. Finally he settled at Florence. Tommaseo's writings cover a very wide field—æsthetic, political, critical, religious, and philosophical—and he is always worth hearing as a sound, honest, and independent thinker, with a fine sense of style. His dictionary of Italian synonyms (1834) was republished by Rigutini (1904, etc.); while the latter end of his life was devoted to an admirable Italian dictionary, which was finished with the aid of Bellini (1861-79). His *Letters* were edited by Verga (1904). See monographs by Barbaro (1882), Tabarrini (in *Vita e Ricordi*, 1884), Brambilla (in *Studi Letterari*, 1892), and Maddalena (1903).

Tommy Atkins. See ATKINS, TOMMY.

Tomsk. (1.) Government, W. Siberia. Its northern part lies within the dense forest zone, but is undulating. South of this is the Baraba steppe, fruitful, but marshy, and full of lakes. Still farther S. are the productive valleys of the Altai, where agriculture and grazing are carried on in unusually favourable conditions for Siberia. Ninety per cent. of the population are Slavs. They breed strong draught horses, and grow corn and tobacco. Along the slopes of the Altai and the Ala-tau mining is extensively pursued. Besides Russians and Ostiaks, Tartars and other Mongol tribes dwell within the limits of the government. Area, 331,159 sq. m. Pop. (1897) 1,947,000. (2.) Chief town of the above gov., on the Tom. A university was opened in 1888. A branch line, 54 m. long, connects Tomsk with the Siberian railway at Taiga. Tomsk was founded in 1604. Pop. (1897) 63,533.

Tomtit. See TIT.

Ton, a measure of weight and capacity. In Great Britain it is equivalent to 20 cwt., or 2,240 lbs. avoirdupois. In the United States a ton is usually 2,000 lbs. (called 'the short ton'), the cwt. being reckoned at 100 lbs., although in the eastern states the ton of 2,240 lbs. (called 'the long ton') is usual with coal and other commodities. As a measure of the carrying capacity of a ship—i.e. the actual tonnage—it is 40 cub. ft., while the register ton is 100 cub. ft.

Tonalite, a group of rocks which consist of quartz, orthoclase, and plagioclase felspar, hornblende and biotite, with sphene, apatite, orthite, and iron oxides as common accessory minerals. Monte Adamello (Central Alps) consists principally of tonal-

lite, but similar rocks occur among the granite masses of the Gallo-way Mts., Scotland. The rocks from Nevada, U.S.A., known as granodiorites, are essentially similar to tonalites.

Tonawanda, tn., Erie co., New York, U.S.A., Niagara R., 10 m. N. of Buffalo; has lumber trade. Pop. (1900) 7,421.

Tonbridge. See TUNBRIDGE. **Tone**, in music, is the interval of a major second. When prefixed by such words as 'full,' 'rich,' 'high,' etc., it indicates the quality or comparative degree of pitch of a musical sound.

Tone, THEOBALD WOLFE (1763-98), Irish politician and lawyer. He took a leading part in the formation of the United Irishmen. In his desire to rid his country of English rule, he wrote in 1794 to the French government, representing that conditions were favourable for a French invasion of Ireland. The discovery of this

6,140 ft. high, on top of which are eight craters of various sizes, is generally called Tongariro; s. of it is Ngauruhoe (7,515 ft.). The craters of Ngauruhoe, Red Crater, and Te Mari are still active.

Tong-king, a French dependency of Indo-China, between 20° and 23° N. and 101° and 108° E., bordering on China to the N.E. and N., and on the Gulf of Tong-king to the E.; area, 46,400 sq. m. The ruling factor of Tong-king is the Song-Koi, or Red River, flowing from N.W. to S.E. Tong-king is divisible into a mountainous and plateau land to the N. and W., clad in bush and forest, and thinly peopled, and a flat and low-lying land to the S.E., the so-called delta, fertile and thickly peopled. The coast, nearly 250 m. long, low and marshy in the S., rises in the N. into precipitous cliffs, bordered with numerous isles. The delta consists of the two distinct deltas of the Red River and Thai-binh.

ebony, and sandal-wood; but they are still difficult of access. Jute has been recently much developed. The most useful animal is the buffalo. Among the native industries that of silk takes the first place. There are cotton mills at Haiphong and Hanoi. The sugar industry is well developed. There are also industries in pepper and oils. The principal port is Haiphong. The exports are mostly rice and animal products. (For values, see INDO-CHINA, FRENCH.) A railway connects Haiphong with Hanoi (60 m.), and another Hanoi with Vinh (200 m.). On Jan. 1, 1902, Hanoi, capital of Tong-king, superseded Saigon as capital of French Indo-China. The population is estimated at ten million natives, mostly Annamese. Tong-king formed an integral part of the kingdom of Annam. A French protectorate was established over Annam (1884). See Imbert's *Le Tonkin industriel et commercial* (1885), Petit's *Le Tonkin* (1892), and Mat Gio's *Le Tonkin actuel, 1870-90* (1891).

Tongres (anc. *Aduaticum Tongri*), tn., prov. Limburg, Belgium, 12 m. N.W. of Liège, is a cathedral city, with distilleries. Its mineral well was known to Pliny. Pop. (1901) 8,763.

Tongue, the special organ of taste, is also an important factor in the process of mastication and in the production of speech. Mucous membrane invests its entire free surface; it is composed of elements analogous to those of the skin—viz., a cutis or corium, which supports numerous papillæ, and is covered by squamous epithelium. The roughness of the tongue surface is due to the papillæ in which the nerves of taste terminate, forming a plexiform network, with brush-like branches and filaments which pass to peculiar end organs known as 'taste goblets.' A mesial fibrous septum divides the tongue into symmetrical halves. Its nerves are branches of the fifth cranial, of the glossopharyngeal, and of the hypoglossal nerves. The two former are the nerves of common sensibility and the sensation of taste, while the last is the motor nerve of the tongue. The muscular fibres run in three directions—transversely, longitudinally, and vertically.

The chief morbid affections of the tongue are inflammations, ulcerations, parasitic diseases, and tumours. In glossitis, or inflammation of the tongue, the whole organ may be swollen, or the mucous surface alone may be affected. Chronic enlargement or hypertrophy of the tongue may follow such an inflammation. Ulcerations of the tongue are produced by injuries such as



Tong-king.

letter drove Tone to America. In 1796 we find him in France, again planning an invasion of Ireland. He committed suicide in an Irish prison while awaiting execution for treason.

Tonga, or FRIENDLY ISLANDS, lie S.E. of the Fiji Is., between 15° and 23° 30' S. and 173° and 177° W. They constitute a British protectorate. Area, 390 sq. m. They are distributed into three groups—Tonga, Hapai, and Vavan. Capital, Nukualofa. Mostly of coral formation, they are very rich in coconuts, copra being the principal export. The total trade amounts to about £170,000 annually. Pop. (1900) 20,677, of whom 20,018 were Tongans (Polynesians).

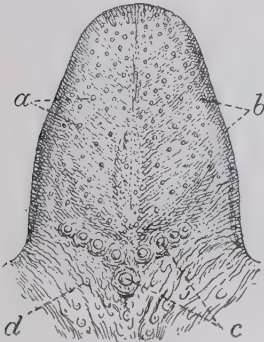
Tongaland. See AMATONGALAND.

Tongariro, a group of volcanic cones S. of Lake Taupo, in the centre of North Island, New Zealand. The northern plateau,

The mountainous region contains gold, silver, copper, lead, zinc, tin, iron, antimony, and cinnabar. On the coast is a coal basin, estimated at 380 sq. m. in area. The hottest season is from the middle of June to the middle of September. By the middle of October the temperature falls to about 68° F. by day, and the mornings and evenings are cold. In November the temperature is as low as 59° and the season dry. The lands of the delta, one vast rice field, yield generally two crops a year. Next in importance are sugar-cane, mulberry, cotton, ricinus, vegetables, areca-nut, and bamboo. The mountainous region produces indigo, tobacco, and coffee. Gamboge is very abundant. Important crops are also betel, pepper, cinnamon, star anise (*Illicium*), and poppy. Leeches, or litchi, is peculiar to Tong-king. The potato thrives. The forests abound in iron-wood,

scalds, by syphilitic affections, by parasitic diseases, and by cancers. Potassium chlorate, boric acid, and thymol vaseline are especially useful as local applications; but syphilitic ulcers require, in addition, specific treatment. The commonest parasitic affection of the tongue is thrush; but lupus and kindred lesions, due to the tubercle bacillus, not infrequently attack the lingual mucous membrane. Of tumours of the tongue the most important is cancer; it should be extirpated by operation.

The tongue furnishes indications of great importance in many morbid conditions. In hemiplegia the tongue curves to one side when protruded, in alcoholism the organ is tremulous, while fibrillar twitchings occur in certain nervous diseases. Scars produced by the teeth may disclose a history of epilepsy. The presence of a fur or coating often points to disorders of the alimentary system. In many febrile conditions the surface becomes dry, brown, and hard; sometimes it is glazed, and exhibits painful cracks and fissures. The peculiar 'strawberry tongue' occurs almost exclusively in scarlatina, and the thick fur known as the 'rheumatic blanket' is typical of certain rheumatic affections.



Tongue.

a, Fungiform papillae; b, filiform papillae; c, circumvallate papillae; d, glands.

Tonic, the fundamental keynote of a scale. See MUSIC.

Tonics, therapeutic agents which increase the vigour of the bodily organs generally, or of one system or organ, and which produce a more prolonged and permanent effect than mere stimulants. Amongst the more common general tonics are iron, nux vomica, quinine, vegetable bitters, cold baths, and exercise. Digitalis and strophanthus are cardiac, iron and arsenic blood, nux vomica and squills vascular, acids and quassia gastric, and strychnine and cinchona nerve tonics.

Tonic Sol-fa. See SOL-FA.

Tonikas, N. American aborigines, originally settled in Mississippi, whence they migrated early in the 19th century to Louisiana. Their language shows some most remarkable peculiarities, and differs fundamentally from those of all the surrounding tribes. See *Transactions American Philological Society*, vol. xx, pp. 150-171.

Tonite, an explosive, prepared by incorporating 54 per cent. of wet gun-cotton pulp with 46 per cent. of barium nitrate. The mixture is then pressed into cartridges and dried.

Tonk, chief tn., feudatory state of Tonk, in Rajputana, India, 1 m. s. of Banas R., and 55 m. s. of Jaipur. Pop. (1901) 38,759. The state has an area of 2,509 sq. m. and a population (1901) of 143,330.

Tonka Bean, or **TONQUIN BEAN**, the seed of *Dipteryx odorata*, or *Coumarouna odorata*, a Guiana shrub belonging to the order Leguminosae. The fruit is a one-seeded dry drupe. The seed or bean is used in perfumery, and for giving fragrance to snuff.

Tonnage. According to the systems of measurement at present in use, the tonnage of a ship means the displacement in the case of ships of war and the registered tonnage in the case of merchant ships. The displacement is the weight of the ship when loaded so as to sink her in the water to her proper draught. The weight of the water displaced is of course equal to the weight of the ship, and the displacement is arrived at by ascertaining the cubic space occupied by the portion of the ship immersed, when she is drawing her proper depth of water, and dividing it by 35, as 35 cub. ft. of water weigh one ton. The dead-weight carrying capacity of a ship is the difference of her displacement at the load line and the light line. The registered tonnage is the measurement of a ship according to the rules contained in the 2nd schedule to the Merchant Shipping Act, 1894, after deducting the allowances sanctioned by sections 78 to 81 of the act. This system of measurement was devised by Mr Moorsome, and has been in force for British shipping since 1854, though some of the deductions were first allowed by acts of later date. The measurement gives the entire cubic capacity of the ship below the tonnage deck. The tonnage deck is the upper deck in ships having less than three decks, and the second deck from below in all other ships. To the cubic capacity below the tonnage deck is added the cubic space between all decks above the ton-

nage deck, ascertained according to the rules in the 2nd schedule, and the cubic capacity of any permanently closed in space on the upper deck, and the total divided by 100 is the gross tonnage of the ship. The net registered tonnage is arrived at by deducting from the gross tonnage measured as above—in case of steamships, the space occupied by the propelling power; and in the case of sailing ships, the space used for the storage of sails; and in the case of any ship, the space used for the accommodation of the master or occupied by seamen or apprentices; and the space used for working the helm, capstan, and anchor gear, or for keeping the chart, signals, and other instruments of navigation, and the boatswain's stores; and the space occupied by the donkey-engine and boiler, if connected with the main pumps of the ship. All tonnage rates and dues are charges upon the registered tonnage, but if deck cargo is carried, the space occupied by it is added to the registered tonnage for the purpose of dues. Most foreign countries have adopted this system of measurement, though they do not all allow the same deductions. Suez Canal dues are charged upon registered tonnage, subject to the disallowance of some of the deductions permitted by the Merchant Shipping Act.

Tonnage and Poundage. Tonnage was the duty (3s.) payable to the king on every tun of wine imported, and poundage the duty (1s.) payable on every pound worth of other merchandise, whether exported or imported. This method of collecting customs duties was in force as early as 1347. An extra duty was laid on certain merchandise imported or exported by alien merchants, an extra 3s. a tun on sweet wine imported, 1s. a pound's worth on tin. These duties were originally levied on the sole authority of the king; but Parliament, in the Stuart period, claimed the right to authorize the collection; and Charles I. came into conflict with it by resisting what he regarded as an invasion of the royal prerogative. The question in the end was compromised by Charles accepting from Parliament a life-grant of the old tonnage and poundage. After the restoration 'mercantile' ideas began to govern policy, and it was not tonnage and poundage, but a customs tariff, from which revenue was derived.

Tonnage Dues and Duties. The following dues are payable to the general lighthouse authorities by ships:—One penny per ton for home-trade sailing ships; twopence farthing per ton for foreign-going sailing ships; two-

pence halfpenny per ton for home-trade steamers; twopence three farthings per ton for foreign-going steamers—in each case per voyage. There are a number of local acts under which tonnage rates are levied, but by section 87 of the Merchant Shipping Act, 1894, they may, with the consent of the Board of Trade, be levied on the registered tonnage of ships, notwithstanding that the local act provides for their being levied upon some different system of measurement.

Tonquin. See TONG-KING.

Tönsberg, the oldest tn. in Norway (founded in 871), Jarlsberg co., 40 m. from Drammen, with a considerable shipping trade. To Tönsberg belongs the greater portion of the Norwegian Arctic whaling fleet. Near here are the ruins of a mediæval fortress and an old royal residence, Sæheim, afterwards Jarlsberg. Pop. (1900) 8,620.

Tonsils, two large rounded glandular bodies, lying at the back of the mouth, between the 'pillars of the fauces.' When inflamed they may meet across the middle line. They secrete a thick grayish fluid. When chronically enlarged, the protruding part can be removed without any apparent disadvantage to the owner. Their secretion is supposed to act simply as a lubricant. The tonsils are apt to become implicated in any inflammatory condition of the throat, and a certain amount of acute tonsillitis (inflammation) may occur with any of the fevers. Acute tonsillitis proper, or quinsy, often occurs alone. It begins, like the fevers, with a rigor, a rise of temperature, a feeling of dryness about the throat, a foul tongue, offensive breath, and a rising temperature, which may reach 104° F. The quinsy may be 'aborted,' though not often. Usually it continues for ten days or so, and then gradually subsides. Often there is suppuration, and generally some swelling externally at the angle of the jaw. A saline purge is the first thing to give. Warm gargles of sodium bicarbonate are best for clearing away any tenacious secretion, after which antiseptics and astringents can be painted on the tonsil, and worked well round it. Hot poultices frequently changed should be applied externally under the ear, and steam may be inhaled to relieve the dryness of the throat. If there is suppuration, the tonsil should be incised early, so that pus may escape. In chronic tonsillitis the tonsils become permanently enlarged and obstruct the breathing. Sometimes deafness results from blocking of the Eustachian tubes. Treatment is by paint-

ing with iodine, or with tannic acid, while raising the tone of the general health with cod-liver oil, iron, and other tonics. This is particularly the case with children. The tonsils are often removed. In follicular tonsillitis the exudation appears in white points at the mouths of the follicles. The inflammation is really in the crypts or hidden recesses of the tonsils, and it is recommended that they be slit open. Tubercle and cancer may appear in the tonsils, and some hold that tubercular infection may start there. The follicles are occasionally found to be stopped up by calculi. Ulceration may follow on inflammation, syphilis, or tubercle.

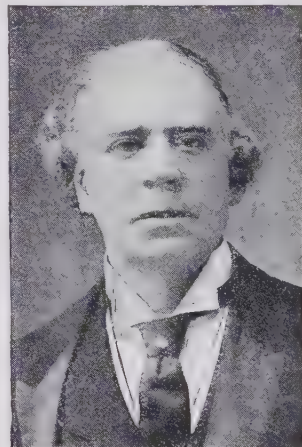
Tonson Family, English publishers. In 1678 Jacob Tonson, the founder of the house, commenced business in London, and was joined by his nephew (of the same name) at the end of the century. They were succeeded in 1736 by a third Jacob, nephew of the second, who died in 1767. The elder Tonson was long connected with Dryden, and the firm brought out works of Addison, Steel, and Pope. See *Knight's Shadows of the Old Booksellers* (ed. 1881).

Tonsure, the cutting of the hair which signifies dedication to a clerical or monastic life. The first mention of clerical tonsure is in the 5th century. Jerome warns the clergy against shaving their heads, lest they should resemble the priests of Isis and Serapis. In the middle ages, the custom of the shaved tonsure became universal. The Eastern clergy shaved the entire front of the head. The Celtic clergy, together with the British, drew a line over the top of the head from ear to ear, and shaved the hair in front of it. The Italians adopted what they termed the coronal tonsure, or tonsure of St. Peter, which left merely a circle of hair around the shorn crown, and was supposed to symbolize the crown of thorns. The question of the shape of tonsure caused one of the most burning disputes between the Celtic and Roman Churches in England.

Tontine, a system of life assurance and of purchasing property whereby the advantage lies at the door of the longest liver among a stated number of individuals. The survivor may either receive absolutely the gross amount of the capital contributed by all those subscribers who have predeceased him, or only the interest upon the sum. The idea was first formulated by an Italian banker, Lorenzo Tonti, who settled in France, and in 1653 suggested his scheme to Cardinal Mazarin as a means of

raising a public loan. The French people did not, however, favour the proposal, and it had no practical realization till in 1689 Louis XIV. formulated a tontine of 1,400,000 livres, divided into fourteen classes of 100,000 livres each, the amount of each personal contribution being 300 livres. The last survivor of this died in 1726, being then in receipt of an income of over 73,000 livres. The tontine principle has frequently been tried in Britain, sometimes in connection with building operations, at others in life assurance. In America it has been largely adopted by some offices.

Tooke, JOHN HORNE (1736-1812), English politician, born in Westminster. In 1760 Tooke accepted the living of New Brentford. After 1765 he began to take part in politics, and published a pamphlet in defence of Wilkes, though later he became his opponent. In 1773 Tooke resigned his living. In 1801 he entered the House of Commons for Old Sarum. He is the author of *Diversions of Purley* (1786-1805). See A. Stephens's *Memoirs* (1813).



John Lawrence Toole.

(Photo by Alfred Ellis.)

Toole, JOHN LAWRENCE (1830), English comedian, born in London, made his first appearance at the Haymarket Theatre in 1852. In 1854, at the St. James's Theatre, he sustained a variety of characters in low comedy, notably Samuel Pepys in *The King's Rival*. From this he went to the Lyceum (1856-9), and on the opening of the New Adelphi Theatre (1859) was engaged as leading comedian. In the same year he created Mr. Spriggins in *Ici on Parle Français*; in 1862 Caleb Plummer in *Dot*, a dramatized version of Dickens's *Cricket on the Hearth*; and in 1868 Joe Bright in *Through*

Fire and Water. In 1866 he impersonated Michael Garner in *Dearer than Life*, and in 1869 Dick Dolland in *Uncle Dick's Darling*, at the Queen's Theatre. In 1874 he made a tour in the United States, which was not a success, and on his return to London reappeared at the Gaiety in 1875. In 1879 he became lessee and manager of Toole's Theatre, where for many years he played regularly, producing among other plays *A Fool and his Money*, *The Upper Crust*, *Stage Dora*, and *Paw Clavdian*. In 1889 he published his *Reminiscences* (new ed. 1892), and in 1890 started on a successful tour in Australia and New Zealand. His last success before retiring was in Mr. J. M. Barrie's play *Walker, London* (1892).

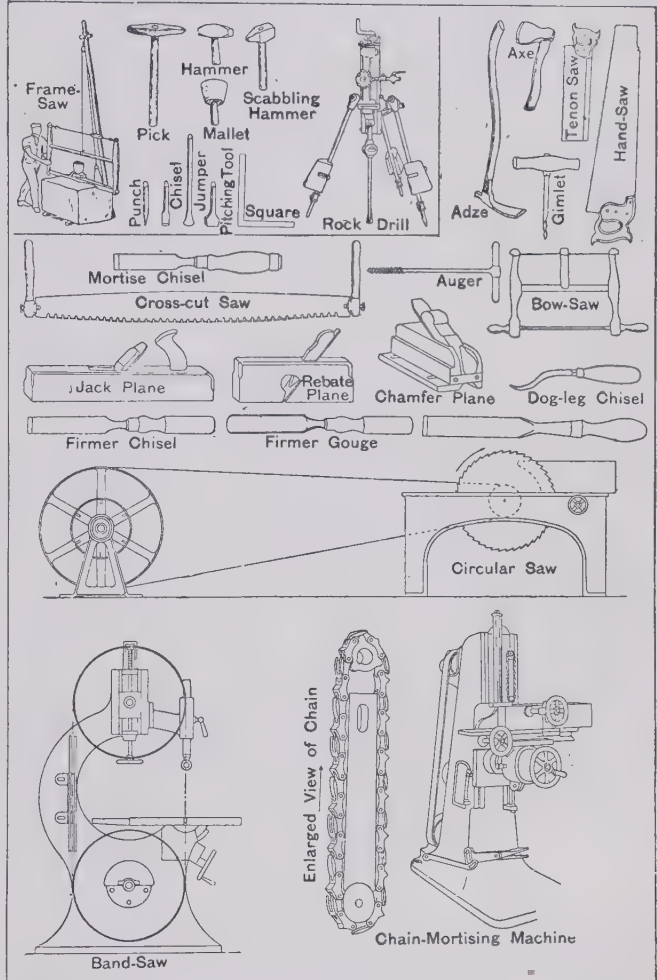
Tooley Street, thoroughfare, Southwark, Surrey, east of London Bridge, famous for several great fires (1836, 1843, 1861) and for the 'Three Tailors,' who claimed to represent the people of England.

Tools, HAND AND MACHINE, are employed in an immense variety of ways for cutting and shaping rough material into finished articles. They may be classified generally into tools for working stone, wood, and metal; other substances, such as ivory, paper, and hard mineral or vegetable matter are cut and fashioned by modified forms of wood-working tools, or by a special pattern of knife. Stone-cutting instruments, owing to the obdurate nature of the material which has to be operated on, are designed rather for strength and durability than for delicacy of execution. The oldest known method of procuring stone from the quarry was by splitting it with wedges, driven in line and struck consecutively with a heavy mallet. Iron wedges are still used for this purpose where rectangular, unshaped blocks of stone have to be obtained. In the preliminary operations of blasting at stone quarries, holes are bored with 'jumpers'—heavy, chisel-ended iron bars—which are lifted a few inches by hand and allowed to drop with their full weight, a quarter turn being given to the bar after each stroke. This action is simulated by the various types of pneumatic and electrical drills, in which a rapid succession of blows is struck with a slowly revolving cutting-head. For loosening and breaking up the masses of rock, the universal tool is a pick—a short, curved bar of steel, pointed at one end and (usually) chisel-edged at the other. To a socket in the centre of this a shaft of ash or hickory is attached at right-angles to the line of the head. A pick is also used for roughly

dressings the faces of squared stones; but for all fine and accurate surface work, chisels of various shapes are employed. These are short bars of steel, sharpened at one end to a square edge of greater or less length, and at the other left blunt to receive the blows of the hammer.

Of wood-working tools the first

The adze, which is used for roughly shaping timber, has a head somewhat resembling that of an axe, but longer, thinner, and curved. The shaft is fixed into a socket transverse to its face, which thus at each blow tends to become parallel to the surface of the timber. The saw is used for cutting timber into square lengths,



Hand and Machine Tools.—I.

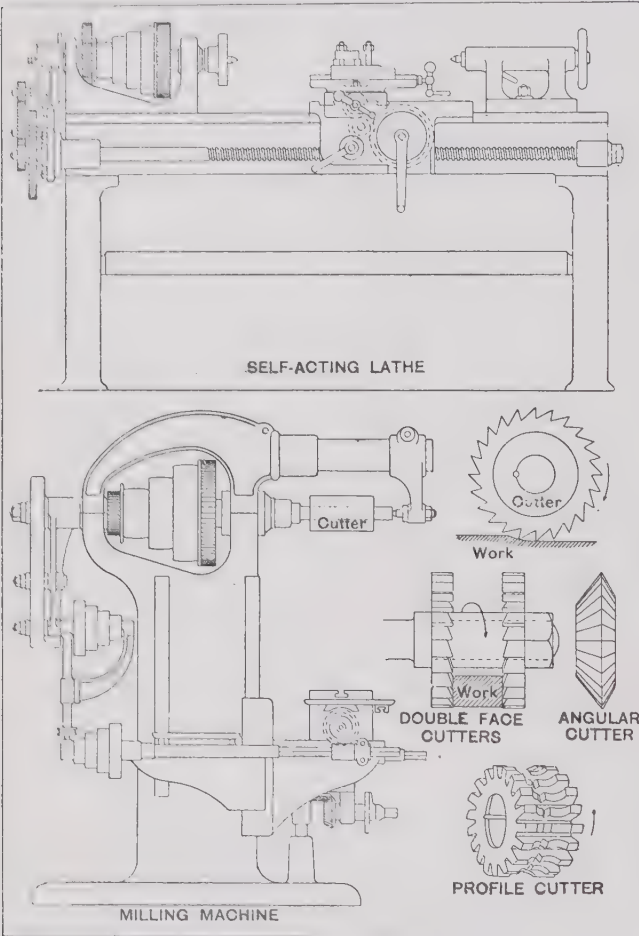
to be employed is the axe, with which trees are cut down and roughly shaped. This has a heavy wedge-shaped steel head, the thin end wide and sharpened to a convex edge, the thick end narrower, and pierced lengthwise to admit the shaft or helve. A curve in the latter gives greater force and ease to a swinging blow.

into planks and boards, and into all sizes subsequently required by the carpenter and joiner. It consists primarily of a thin steel blade, one edge of which is cut into angular teeth. The points of these teeth are bent slightly outwards to alternate sides of the blade, thus producing, when the saw is drawn backwards and for-

wards across the wood, a cut slightly wider than the thickness of the blade, which is then able to enter freely. Hand-saws have a broad tapering blade about two feet long, with a wooden handle shaped to a grip at the wider end. Tenon saws are shorter, with finer teeth, and are used for more delicate work, the blade being of one width throughout, and

on a level bench. A blade of 18 in. diameter, running at a speed of 1,800 revolutions a minute, makes a cut $6\frac{1}{2}$ in. deep, an engine of 1 h.p. being needed to drive it. One of 4 ft. diameter makes a 21 in. cut, revolves 800 times a minute, and requires an expenditure of 7 h.p. For work which is finer, or for cutting wood in curved lines, band-saws

tension on the band is maintained by means of a helical spring, which presses upwards the bearings of the top pulley. Strong band-saws are used also for cutting sheet metal. Planes are employed to give a smooth, level surface to wood for the joiner. The jack plane consists of a rectangular, solid piece of wood, about 18 in. in length. Through an inclined slot in the middle of this an edged blade is adjusted, at an angle of about 60° , so as just to come into contact with the wood to be 'surfaced,' off which, when the plane is slid forward, it pares a thin shaving. More special forms of planes are made for cutting grooves, or 'rabbeting,' and for bevelling the edges of boards to any angle. In machine planes the wood is fed forward by means of rollers along an iron bed-plate, and passes under a rapidly revolving drum, which can be adjusted in height according to the thickness of the wood. A series of knives is arranged diagonally on the circumference of the drum, at such an angle as to take off the surface of the wood smoothly and accurately. All joints in carpentry and joinery are formed by means of chisels, struck with a wooden mallet to make a cut across the fibres of the wood. A chisel consists essentially of a stout steel blade, from 4 to 6 in. long, and of varying widths. The end is ground (on one side only) to an angle of about 20° , to form a cutting edge. Gouges are corresponding tools of a curved section, so that the edge makes a segmental cut. Their use is chiefly to cut away superfluous wood to within a small distance of the finished face. Both classes of tools are fixed into handles of beechwood for manual use. Carving chisels and gouges are similar, but with finer blades, ground to a more razor-like edge. In mortising and tenoning machines the wood rests between guides on a table; while the chisel, or cutter, with a slow, reciprocating motion, cuts away the waste material in a series of strokes from above. All shaping into forms of a curved section is accomplished in lathes, in which the chisel remains stationary during each cut, while the wood revolves between pivots or about the axis of a metal 'chuck,' or holder. In automatic turning, and for forming curves other than segmental, the cutter is made to move in and out in accordance with the motion of a stud, which itself presses on the surface of a revolving template, or dummy, exactly similar in shape to that of the finished object. Holes are bored in wood with an auger—a pointed, cross-handled bar on which a screw-thread is formed. Small sizes



Hand and Machine Tools.—II.

stiffened by a rib at the back. Cross-cut saws are worked by two men, one of whom pulls (and makes the cut), while the other draws back the saw (idle). The blade is long, with coarse, strong teeth, and a handle at each end. In machine saws of the circular pattern a blade with teeth round its circumference revolves rapidly on a belt-driven shaft, the timber being slid past it between guides

are used. The blade in these is a flexible, endless steel band, from $\frac{1}{8}$ in. to 6 in. in width, running over two or more pulleys, the rims of which are covered with vulcanized rubber. One of the pulleys is driven by an axial shaft at a speed of from 300 to 400 revolutions per minute. The material to be cut rests on a slotted table, through which the saw runs on roller guides; the requisite

are known as gimlets. In a simple wood-boring machine the auger is fixed in a vertical spindle, which is made to revolve by bevel-wheels from a belt-driven shaft, a downward pressure being given to the cutting tool by a counterweighted lever above.

Iron-working tools are, with but few exceptions, modifications or adaptations of the chisel and the file. For use in lathes, which perform so large a part in the shaping of machinery, the chisel, or cutter, has a half-round point and is held in a slide-rest. This, actuated by a revolving screw, travels automatically along the bed-plate of the lathe, the cutter taking off in its course a continuous, spiral shaving of metal. In a screw-cutting lathe the cutter has an angular point, and the speed of travel is increased so that the screw-thread is left untouched in a course parallel to the spiral cut. Planing machines consist of a heavy slotted table, sliding with a reciprocating motion on a solid bed by means of a screw or rack. Uprights are rigidly fixed to one end of the bed, and connected by a cross-slide which bridges the table, and is capable of being raised or lowered at will. A slide-rest, holding the vertical cutter, is attached to the cross-slide, being moved automatically along it by a screw. The metal to be planed is fixed on to the table; the cross-slide is adjusted so that, on the table travelling forward, a cut of the correct depth is taken off the surface of the metal throughout its length. By an ingenious contrivance the table travels with a slow forward motion, and with a return (when no cut is made) of from twice to three times the speed. The hand-file has a flat blade of hardened steel, the surface of which is cut into a series of diagonal grooves and ridges. For milling machines a revolving drum, with ridged or milled surface, is used as a cutter, the metal resting, as in a planing machine, on a travelling table. In this case, however, the table can be moved sideways and lengthways, either automatically or at will; the milled drum makes from 100 to 300 revolutions per minute. See DRILLS and DRILLING.

Toothache. See DENTISTRY.

Tooth Ornament, a form of architectural decoration, which consists of a four-leaved flower, much in vogue in Early English architecture, and sometimes seen in specimens of Later Norman work. As a rule, it is placed in a hollow moulding, the flowers often being in close contact.

Toothwort, a genus of plants belonging to the order Orobanchaceæ. They have a bell-shaped calyx and a two-lipped corolla. The British toothwort grows in

woods on hazel roots. The stem branches beneath the surface of the soil, and is covered with scales. The purple flowers are borne in spring.

Toowoomba, tn., Queensland, Australia, 100 m. w. of Brisbane by rail, on the summit of the Dividing Range, nearly 2,000 ft. above sea-level; is the centre of a fertile district on the Darling Downs. It has flour mills, saw mills, tanneries, soap and jam factories, and a brewery, and wine is made. Pop. (1901) 9,137.

Topaz, an aluminium silicate and fluoride, $Al_2F_2SiO_4$, containing up to 20 per cent. of fluorine. It has a hardness of 8, a specific gravity of 3.4, and a very good basal cleavage. Its lustre is vitreous or somewhat pearly on the basal plane, and as a rule the mineral is fresh and unweathered. The colour is usually honey yellow, but gray, red or pink, green, and blue varieties occur, and when of a fine colour and transparent are used as gems. Some Brazilian topazes, when heated, become pink, resembling Balas ruby, and in this state are a good deal used for the cheaper kinds of jewellery. Topaz becomes electrified when warmed or pressed. As a precious stone it is less valued now than formerly. Topaz is found in Scotland (Aberdeenshire), Ireland (Mourne Mts.), and Cornwall. It frequently accompanies tin stone, tourmaline, and white mica. In the tin-bearing districts of Saxony it is very abundant. The finest topazes are found in Brazil and the Ural Mts. Crystals have been discovered in Siberia weighing thirty pounds. In Africa, the E. Indies, Japan, and America (Connecticut), the ordinary varieties of topaz are known to occur. Yellow quartz is sometimes sold as topaz. Oriental topaz is yellow sapphire.

Tope (*Galeus canis*), a small British shark belonging to the family Carchariidæ, and widely distributed over tropical and temperate seas. It is usually about six feet in length, and is much disliked by fishermen on account of its habit of taking away bait, and driving off other fish. It is a bottom form, feeding upon fish, crustaceans, etc. The colour is dark gray above and dirty white beneath, and the fish is viviparous, producing a large number of young at a time. Another species of the same genus is found in Japanese waters.

Tope, STUPA, or CHORTEN, a structure erected by Buddhist monks for the preservation of sacred relics. Topes are built of solid masonry in some cases, and of loose stones in others; have sometimes a spherical base, in other instances a polygonal one, though a few are circular. They

abound in Central India, in Kashmir, and the Indus valley, and in Ceylon, where they are called 'dagobas.'

Topeka, tn., cap. of Kansas, U.S.A., co. seat of Shawnee co., 57 m. w. of Kansas City, on Kansas R. Flour-milling is the principal industry. Pop. (1900) 33,603.

Topelius, ZACHRIS (1818-98), Swedish author, born at Kuddnäs in Finland; became (1854) professor of history at Helsingfors University. After Runeberg, Topelius is the most prominent and popular of the Swedo-Finnish authors. His best lyrics are contained in *Ljungblommor* (1845-54), *Sånger* (1861), and *Nya Blad* (1870), all marked by tender religious feeling, exquisitely expressed. He has also written dramas of considerable merit—e.g. *Efter Femtio år* (1851) and *Regina von Emmeritz* (1854)—but is best known by his cycle of historical romances, especially the famous *Fältskärns Berättelser* (5 vols. 1853-67), of which there is an English translation (1884). His books for children (*Läsning för Barn*, 1865-91) also are perfect of their kind. See R. N. Bain's 'Topelius,' in *Cosmopolis* (1899).

Töpffer, RUDOLF (1799-1846), Swiss author and artist, was born at Geneva, and kept a boarding-house from 1825 till his death, also becoming professor of rhetoric in the Geneva Academy (1832). Among his early works were the popular *Voyages en Zigzag* (1843-53), followed by the equally successful *Nouvelles Genevoises* (1845) and *Rose et Gertrude* (1846). A volume of comic pictorial sketches, entitled *M. Vieux-Bois*, appeared in the United States under the title of *Adventures of Mr. Obadiah Oldbuck* (1842). See Sainte-Beuve's *Portraits Contemporains*, vol. iii.; and *Lives*, in French, by Relave (1886), and Blondel and Mirabaud (1887).

Tophane. See CONSTANTINOPLE.

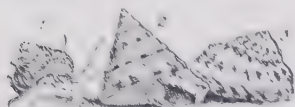
Tophet. See GEHENNA.

Top-knot (*Zeugopterus*), a genus of small flat fish, closely related to the turbot. An example is *Z. punctatus*, a fish about six inches long, not uncommon on the south coasts of England, and called 'bastard brill' by the fishermen. The scales are furnished with long spines.

Toplady, AUGUSTUS MONTAGUE (1740-78), English hymn writer, was born at Farnham, Surrey. He became (1768) vicar of Broad Hembury, but three years before his death removed to London, where he preached in the French Calvinistic chapel. Although most widely known as the author

of the hymn *Rock of Ages*. Toplady was a Calvinistic controversialist, and published *Historic Proof of Doctrinal Calvinism of the Church of England* (1774). See *Memoir* by W. Row (2nd ed. 1825).

Töplitz. See TRPLITZ.



Top-shell.

1. Gray top. 2. Common top. 3. Painted top.

Top-shell, a general name for gastropod molluscs belonging to the two families of Trochidae and Turbinidae. Both the Trochidae and the Turbinidae are remarkable for the beauty of their shells, which are in some instances of economic importance. The first family is cosmopolitan, while the Turbinidae are chiefly found in warm seas.

Torah, the Hebrew word for law. Primarily it means an authoritative direction, given by the priests in the name of God, on all questions of moral, ceremonial, or religious duty. Later, when the law was written, the word came to be used for the Pentateuch, as containing the law of God through Moses.

Torenia, a genus of mostly tropical herbaceous plants, belonging to the order Scrophulariaceae. They bear short, few-flowered racemes of flowers, often highly coloured, and are easily grown in a light soil containing leaf-mould. They like a fairly warm temperature.

Toreno, QUEMPO DE LLANO, Y GAYOSO, COMTE DE (1840-90), Spanish Conservative statesman, was born at Madrid, and after the Bourbon restoration (1874) became (1875) minister of public works, minister of foreign affairs (1879), president of the House of Deputies (1880), and in 1885 again president of the House of Deputies, a post he retained till his death.

Torfaus, THERMODUS (1636-1719), Icelandic historian and antiquary, translated the Icelandic MSS. in the king of Denmark's library, and became historiographer to King Christian V. His best-known works are *Orcades, seu Rerum Orcadensium Historia* (1697), *Historia Rerum Norvegiarum* (1711), and *Historia Finlandiae Antiquae* (1705).

Torgau, *tn.*, prov. Saxony, Prussia, on l. bk. Elbe, 31 m. E.N.E. of Leipzig; has manufactures of gloves, glass, and pottery. Its 15th-century castle (Hartenfels) is now used as a barracks. Luther's wife is buried in the town church. The museum

contains a selection of Saxon antiquities. The fortress was dismantled in 1889. Pop. (1900) 11,807.

Torjok, or TORZHOK, *tn.*, Tver gov., Central Russia, 40 m. W.N.W. of Tver city; is a river-port and episcopal see, with various manufactures. Pop. (1901) 15,419.

Tormentil, the popular name of a common British trailing plant, *Potentilla tormentilla*.

Tormentos. See PAMPERO.

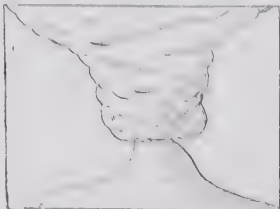
Tornado, a local whirlwind of great intensity, usually formed within a thunderstorm. The most marked feature is a funnel-shaped cloud, which rotates rapidly with a movement opposite to that of the hands of a watch, taking on the average about six minutes to pass any spot. The length of the destruc-

translation, which on the mean averages about thirty miles an hour; (2) a complex gyration; (3) a swaying motion to and fro like an elephant's trunk; and (4) a rising and falling motion, the end of the funnel rising from the surface of the ground and then descending. The most destructive and dangerous form of tornado is that shown in the accompanying illustration. The most elaborate discussion of tornadoes in the United States is by J. P. Finley, who catalogued all the instances observed from 1794 to 1881, and constructed a map which shows the distribution in the various states. Over 10 per cent. of recorded tornadoes were observed in Kansas. Illinois and Missouri come next, and the states of Iowa and Nebraska also have frequent visitations. See J. P.



Toronto and Neighbourhood.

tive band averages between 28 and 29 m., and its breadth varies from 40 to 10,000 ft., with a general average of about 1,100 ft. Tornadoes occur at all periods of the year, but are most common in summer and least in winter.



Funnel Cloud of Tornado.

It is calculated that the upward velocity of the air must be 176 miles per hour at the lowest estimate. The tornado funnel cloud as a whole has four well-marked motions—(1) a motion of

Finley's 'Report on the Character of Six Hundred Tornadoes,' in *Professional Papers, U.S. Civil Service, No. VII.* (1894); Davis's *Elementary Meteorology* (1894).

Tornéa, *tn.* and tourist resort, Uleaborg gov., Finland, at the head of the Gulf of Bothnia, at the mouth of the Tornea, which forms the boundary between Sweden and Finland. Pop. 1,000.

Toro, city, prov. Zamora, Spain, 37 m. W.S.W. of Valladolid; is a very ancient fortified city on the Douro, famous for its fruit and wine. Pop. (1900) 8,379.

Toronto, city, cap. of Ontario, Canada, is situated on a bay on the N.W. shore of Lake Ontario, and slopes up gradually from the lake. Yonge Street, running N. and S., is the backbone of the city. There are many public buildings of considerable architectural merit,

especially the city hall and law courts and the university. The chief churches are the Metropolitan Methodist, the Anglican cathedral, and the Roman Catholic cathedral. Toronto is the see of an Anglican bishop and of a Roman Catholic archbishop. It is an educational centre. It has a public library, as well as the university and the legislative libraries. Its harbour on the lake is easy of access, and is much frequented by the lake shipping, its total trade amounting to over eight millions annually, of which 75 per cent. is for imports. There are foundries, agricultural implement works and machine shops, breweries, and a very large distillery, tanneries,

includes Whitehead's invention and its developments. The Whitehead torpedo is of steel and is spindle-shaped, and in the British service varies in length from 12 ft. 4 in. to 16 ft. 7½ in. The first Whiteheads, based upon suggestions conveyed to the inventor in 1864 by Captain Luppis of the Austrian navy, were very different machines from those now in use. The component parts of the latter are as follows:—The explosive head, in which some high explosive, such as gun-cotton, is placed. At the extreme nose there is a pointed rod, which projects forward, and which, when struck, ignites the explosive by crushing a case filled with fulminate of mercury. Behind the explo-

the torpedo dives, the reverse happens. In conjunction with the weight there are discs, which by being forced inwards, owing to the increased pressure of water when the torpedo dives, act upon the steering gear and automatically rectify the level. In some torpedoes the balance chamber contains the stop-valve for preventing the air from leaking out when the torpedo is charged; the charging valve, at the opening where the air is pumped in from the reservoir; the starting valve; and the delay-action valve, for preventing the screws from revolving before the torpedo gets well into the water. There is also the reducing valve, for regulating and making uniform the



Toronto: View from Parliament Building.

(Photo by Notman, Montreal.)

soap works, canning and packing establishments. Pop. (1901) 207,971. The city was founded (as York) in 1794 by Governor Simcoe, and it has been the capital of the province since 1797.

Torpedo, a case or closed vessel, charged with an explosive, which may be blown up when near or in contact with the underwater portion of a hostile ship. Torpedoes may be either stationary, in which case they are generally known as mines (see SUBMARINE MINES), or mobile. Spar torpedoes are fixed at the end of a spar in the bows of a boat or steam pinnace, and are driven against an enemy's ship. Towing torpedoes (e.g. the kind invented by Captain Harvey) are now obsolete. The automobile torpedo

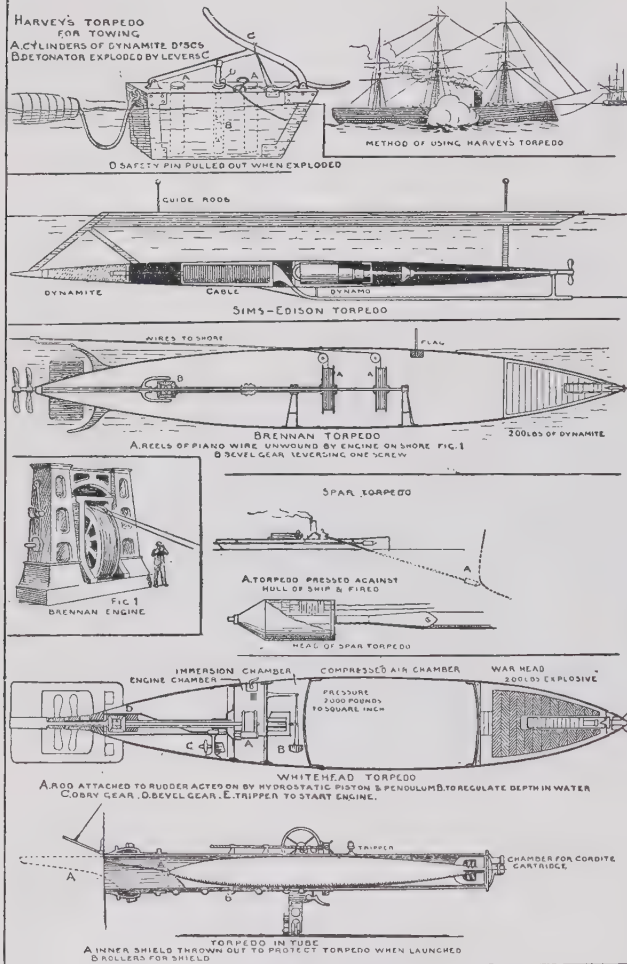
sive compartment lies the air chamber for holding the compressed air that supplies the motive power. The chamber is a solid piece of the finest Whitworth steel. The balance chamber comes immediately abaft the air chamber, and contains the apparatus which keeps the torpedo at its proper distance below the surface, and another apparatus—the gyroscope—for keeping it in the right lateral direction or vertical plane. These two mechanisms influence two rudders, one horizontal and one vertical. The former is worked by a pendulum weight, which, when the torpedo points upwards, swings backwards, and, by a simple arrangement, throws the horizontal rudder downwards. When

amount of air passing from the air chamber to the screw mechanism. To prevent the pendulum weight from flying backwards when the discharge takes place there is, moreover, a controlling gear. The engine-room contains a servo-motor for applying to the horizontal rudder the power which is exerted by the balance mechanism, and the engines, which are now of a three-cylinder single-acting type, the invention of Mr. Brotherhood. The buoyancy chamber gives the necessary buoyancy to the torpedo. Lastly, the tail comprises the two perpendicular fins, the wheel gearing for turning the two propellers in opposite directions, the vertical and horizontal rudders, and the two propellers. Tor-

pedoes are either discharged from a tube by means of a small charge of powder, or are dropped into the water, in which case 'dropping gear' is usually employed. This is a device whereby the torpedo is set working and released from a cradle, in which it hangs until the moment of liberation, as though in two pairs of tongs.

Dirigible Torpedoes may be divided into two classes: dianemic torpedoes, or torpedoes which are guided from the directing station by means of wires, which either work mechanically (as in the Brennan torpedo) or transmit electrical power to machinery within the torpedo (as in the Sims-Edison torpedo); and acti-

bours and estuaries, and is the invention of an Australian, Louis Brennan, who sold his device to the British government in 1882. The torpedo is worked by means of a stationary steam-engine. The weapon itself is a hollow steel spindle. In its head is a heavy explosive charge; in its body are a delicate hydrostatic arrangement for regulating the depth of immersion, and two reels, upon each of which is wound strong fine steel piano wire. On the back of the torpedo is a steel flagstaff, bearing a flag, whereby the position of the weapon can be watched from the observing station. The torpedo having been launched, motion is imparted to its two screws by rapidly unwinding, by means of the engine on shore, the wire from the reels in the body of the machine. See Jacques's *Torpedoes for National Defence* (1886); Sleeman's *Torpedoes and Torpedo Warfare* (1889, and later eds.); *Instruction in Military Engineering—Military Mining* (School of Military Engineering, Chatham); Bucknill's *Submarine Mines and Torpedoes as Applied to Harbour Defence* (1889); Publications of the Torpedo Station, Newport, Rhode I. (1874-1901); Armstrong's *Torpedoes and Torpedo Vessels* (1896).



Types of Torpedoes.

Other types of automobile torpedoes are the Schwartzkopf, a German modification of the Whitehead; the Howell, the motive power of which is derived from a rapidly rotating flywheel; and the Bliss-Leavitt, a turbine-driven torpedo of greatly increased range and speed, which has been adopted in the United States navy.

nauts, or submarine vessels, including torpedoes to which the directing power is transmitted by means of rays or ethereal waves, without the use of wires or any material connections. To this class belong the Orling-Armstrong submarines, and the Fiske and the Govan torpedoes. The Brennan torpedo is largely used for the defence of British har-



Torpedo, or Electric Ray.

Torpedo, or ELECTRIC RAY, a genus of elasmobranch fishes, remarkable for the presence of a well-developed electric organ, capable of giving a powerful shock. This organ is placed anteriorly between the pectoral fins and the head, and is composed of a series of vertical prisms. The object of the discharge is to stun the fish upon which the torpedo preys, or to resist attack. There are about six species, three of which occur in the Mediterranean. When full grown, torpedoes reach a width of from two to three feet, and examples of this size are said to be able to stun a man completely.

Torpedo Boat, a fast vessel, specially designed for launching torpedoes against an enemy's ship. The first was built for the British

government in 1877. Torpedo boats may be grouped in three classes: (1) boats of the sea-going type, of 126 ft. or more in length; (2) boats of from 101 to 120 ft. in length, suitable for short runs, and for general work near a coast; and (3) still smaller boats, including those which are capable of being hoisted in and out of a sea-going ship. (For a comparative statement of the torpedo boats of the various powers, see NAVIES.) Few of the earlier torpedo boats had a speed of more than from 16 to 18 knots. Typical modern first-class boats are 140 ft. long, 15 ft. 6 in. broad, draw about 6 ft. of water, displace 180 tons, have engines of about 2,000 indicated horse-power, and can steam at somewhat over 23 knots an hour. They carry 18 men, 3 torpedo ejectors, and 3-pound quick-firing guns.

Torpedo-boat Destroyer. See DESTROYERS.

Torpedo Ejector, or **TORPEDO TUBE**, the tube or gun from which an automobile torpedo, such as the Whitehead or the Howell, is usually discharged.

Torpedo Gunboat, or **TORPEDO-BOAT CATCHER**, a vessel of which a considerable number were built in England between 1885 and 1894; they were, in effect, fast gunboats, fitted with light guns and torpedo ejectors. The earliest craft of the type was the *Rattlesnake*, of 550 tons displacement, 2,700 indicated horse-power, and an extreme speed of 18.5 knots. Later vessels of the sort were much larger, those of the *Dryad* class displacing 1,070 tons, but having no greater speed. They have been supplanted by the torpedo-boat destroyer.

Torpedo Net, a net which may be hung round a ship as a protection against torpedoes. The meshes are made of steel wire rings, originally about 6 in., but latterly only about 1½ in., in diameter, connected by smaller galvanized steel rings. The small-meshed net, introduced about 1898, is known as the grommet. The nets are secured to a stout jack-stay at the top, and to a chain at the bottom to make them hang perpendicularly. They are suspended from the ends of booms, made of hollow steel, about 30 ft. long, rigged out from the ship's side at a distance of about 45 ft. apart.

Torpedo-net Cutter, a contrivance for cutting torpedo nets. The most successful type is the invention of Admiral A. K. Wilson. Nearly all consist of hinged joints working across one another, and attached to a pair of powerful wire-cutters. The apparatus is fixed to the nose of a torpedo, and the cutters work by means

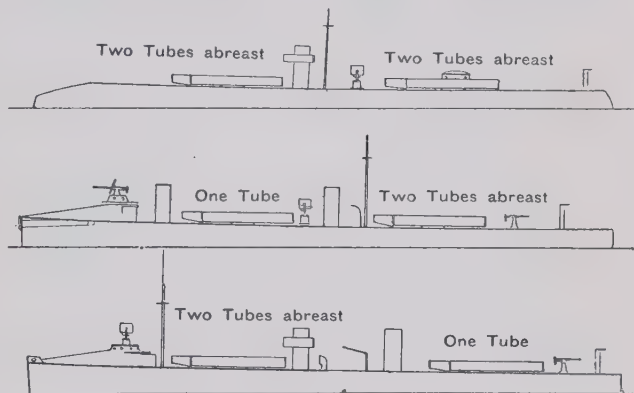
of the forward pressure of the torpedo, or of the release of a powerful spring, or by the force of an explosion which closes the nippers.

Torquatus, the name of several distinguished Romans. (1.) **TITUS MANLIUS IMPERIOSUS TORQUATUS**, a hero of early Rome, won his name Torquatus in 361 B.C. by slaying in single combat a gigantic Gaul, from whom he took his gold necklet (*torques*). He was three times consul—in 347, 344, and 340—and had previously twice been dictator—in 353 and 349. In his last consulship he and his colleague, Decius Mus, defeated the revolted Latins in a great battle near Mt. Vesuvius. (2.) **TITUS MANLIUS TORQUATUS**, was consul in 235 B.C., when he conquered Sardinia; censor in 231, and consul again in 224. In 216 he opposed the ransoming of the Romans taken

have been found in Britain and Ireland, the more common being of a funicular shape, with a hook at one end by which they are fastened to a similar hook at the other.

Torque. See TORSION.

Torquemada (or **TURRECREMATA**), **JUAN DE** (1388–1468), Spanish cardinal (styled 'defender of the faith'), was born at Valladolid, and entered the Dominican order there. After attending the councils of Basel and Florence, he was created a cardinal (1439), and became bishop of Palestrina (1455) and of Sabina (1464). He was afterwards head of the Spanish Inquisition and confessor to Isabella II. Among his works are *Summa Ecclesiastica* (1550), *Expositio super toto Psalterio* (1474), and *Commentarii in Decretum Gratiani* (1578). See *Life* in German by Lederer (1879).



Types of Torpedo Boat.

1. Yarrow, 20 class. 2. 90 class. 3. No. 113.

prisoners at Cannæ. He was dictator in 210 B.C. (3.) **LUCIUS MANLIUS TORQUATUS**, consul in 65 B.C.; in 63 he aided Cicero to suppress Catiline's conspiracy. (4.) **LUCIUS MANLIUS TORQUATUS**, son of the preceding, fought against Cæsar in the civil war. In 48 B.C. he was captured by Cæsar, and was released unharmed; but he took up arms again in Africa. When the Pompeians were defeated in Africa in 46 B.C., he was captured at Hippo Regius.

Torquay, munic. bor., and seaside resort, Devonshire, England, picturesquely situated on Tor Bay and Babbacombe Bay. Some remains exist of Tor Abbey, and about a mile from the centre of the town is Kent's Hole, a noted bone cavern. Pop. (1901) 33,625.

Torque, a twisted collar of gold or other metal, formerly in use by the people of Asia and N. Europe. Many fine specimens

Torquemada, **TOMAS DE** (1420–98), inquisitor-general of Spain, born at Valladolid; became a Dominican monk at Segovia; was appointed by Ferdinand and Isabella first inquisitor-general of Spain (1483).

Torre Annunziata, tn., Naples prov., Italy, at s. base of Mt. Vesuvius, 14 m. by rail s.e. of Naples; has a government factory for arms. Macaroni is manufactured. It suffered from the eruption of 1906. Pop. (1901) 28,084.

Torre del Greco, seapt., fishing tn., and seaside resort, Naples prov., Campania, Italy, at the south-western base of Mt. Vesuvius, 8 m. by rail s.e. of Naples. It has frequently suffered from the eruptions of Vesuvius (e.g. in 1906). Coral-working is an important industry. Pop. (1901) 35,328.

Torregiano. See TORREGIANO.

Torrens, LAKE, large salt lake, S. Australia, w. of the Flinders Range, 35 m. N. of Port Augusta, Spencer's Gulf, extends 130 m. from S. to N., and has an average breadth of 20 m. In dry seasons it is a mere salt marsh. It was discovered by Eyre.

Torrens, SIR ROBERT RICHARD (1814-84), colonial premier and agrarian reformer, was born in Cork, and going out to Australia (1840) became collector of customs (1841) and colonial treasurer (1852). After the introduction of responsible government (1855) he entered the legislature, became premier (1857), and introduced the 'Torrens Act,' a measure of land reform which has been copied in most new countries. He retired from politics to become administrator of the new law—a post he filled till his retirement in 1863.

Torrens, WILLIAM TORRENS M'CULLAGH (1813-94), Irish politician and author, was born near Dublin; became (1835) assistant commissioner to the Irish Poor Relief Commission, and in 1846, at the suggestion of Cobden, with whom he was associated in the Anti-Corn Law League, wrote his *Industrial History of Free Nations*. In 1847 he entered Parliament, and till his withdrawal from public life (1885) was active in promoting measures of social reform. He wrote several political biographies and a *History of Cabinets* (1894).

Torre Pellice, or **LA TOUR**, Italian summer resort, among the Alps, 30 m. S.W. of Turin; has silk-spinning and cotton-weaving. For centuries it has been the headquarters of the Waldenses. Pop. (1901) 5,898.

Torres Strait, between New Guinea and York Peninsula, Queensland, Australia, is from 80 to 90 m. broad. Navigation is rendered difficult by reefs, shoals, and islands (Prince of Wales, Mulgrave Banks); but a perfectly safe route, N. of the Prince of Wales group, is regularly used by steamers. The strait was first navigated in 1606 by the Spaniard Torres, but its present name dates from 1762.

Torres Vedras, tn., prov. Estremadura, Portugal, 26 m. by rail N.W. of Lisbon; has hot sulphur baths. Wellington's famous lines (1810-11) extended from near Torres Vedras to the Tagus. Pop. (1900) 6,891.

Torrey, BRADFORD (1843), American essayist, born at Weymouth, Massachusetts; is on the editorial staff of the *Youth's Companion*, and has published several volumes of 'nature essays,' including *Birds in the Bush* (1885), *A Rambler's Lease* (1889), *The Foot-pathway* (1892), *A Florida Sketch-book* (1894),

Spring Notes from Tennessee (1896), and *A World of Green Hills* (1898).

Torricelli, EVANGELISTA (1608-47), Italian mathematician and natural philosopher, was born at Modigliana in the Romagna. A treatise on motion which he wrote attracted the notice of Galileo, whose amanuensis he became at Florence (1641), and on whose death he was appointed mathematician to the Duke of Florence. He improved the construction of telescopes and microscopes, and it is considered he was the first to ascertain the gravity of the air by means of mercury in a glass tube, whence resulted the barometer, the vacuum in which is known as the Torricellian vacuum. His chief work is *Opera Geometrica* (1644).

Torrigiano, or **TORREGIANO**, **PIETRO** (1470-1522), Florentine artist, became a fellow-student of Michael Angelo. He visited (1509) England, then Spain, where he fell into the hands of the Holy Office for breaking to pieces a statue of the Virgin. He was condemned to the stake, but starved himself to death. One of his greatest achievements was the tomb of Henry VII. in Westminster Abbey.

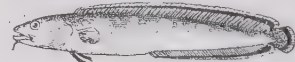
Torrington, GREAT, munic. bor. and mrkt. tn., N. Devonshire, England, on a hill above the Torridge, 7 m. S.E. of Bideford; has manufactures of silk gloves, flour-milling, and leather-dressing. Pop. (1901) 3,241.

Torrington, GEORGE BYNG, VISCOUNT (1663-1733), British naval officer. In 1688 he was largely instrumental in winning over the fleet to the Prince of Orange. In 1690 he was in command of the *Hope* at the battle off Beachy Head. In 1702 he served with Sir George Rooke, and in 1703 was in command of the squadron at the capture of Gibraltar, and of a division at the battle of Malaga in 1704. In 1706 he was in command of the fleet at the taking of Alicante, and in 1718 won the victory over the Spanish off Cape Passaro. For these services he was created Baron Byng of Southill and Viscount Torrington. In 1727 he was appointed first lord of the Admiralty. See *Memoirs Relating to the Lord Torrington* (Camden Soc. 1889).

Torsion, in mechanics, the state of strain in an elastic material subjected to a simple twist. The condition is most clearly realized in the case of a straight cylindrical rod which has been twisted about its axis. In such a case the strain is one of pure distortion, and does not involve change of volume. The ratio of the supporting stress to the strain is called the rigidity

of the material. The moment of force required to sustain the condition of twist in a given rod is called a 'torque;' and when the twist is unity, the torque is the measure of the torsional rigidity of that particular specimen. It can be easily shown that the torsional rigidity of a cylindrical wire or bar of a given material increases as the fourth power of the diameter. In the so-called torsion balance the torsional rigidity of a wire is used for the measurement of various kinds of forces. By its means Cavendish measured the gravitation attraction between two masses of lead, and thus determined the mass and mean density of the earth; and Coulomb similarly measured the attraction between electrified and magnetized bodies. The most important practical application of the torsional rigidity of a wire is in the ordinary spring balance. When a coiled spring is drawn out, the wire becomes more twisted; and when it is pushed in, it becomes less twisted. It is this change of twist, calling into play the torsional rigidity of the wire, which constitutes the resistance of the spring to change of form. See ELASTICITY.

Torsion Balance. See ELEC-TROSTATICS.



Torsk.

Torsk, or **TUSK** (*Brosme brosme*), a food fish belonging to the cod family. It is found on both sides of the Atlantic, and is abundant off the Shetland Is. The body is cylindrical; there is one very long dorsal and one long ventral fin; the scales are minute, and the general colour grayish, the margins of the fins being tinged with yellow. In length the fish varies from eighteen inches to three feet. Torsk is less valued fresh than in the dried and salted condition. In Great Britain it extends southward as far as Grimsby.

Torstensson, LENNART, COUNT (1603-51), Swedish soldier, born at Torstena; followed Gustavus Adolphus to Germany in 1630, and served under him and Banér. After Banér's death (1641) he received the supreme command of the Swedish forces in Germany. In 1642 he defeated the Duke of Lauenburg at Schweidnitz and the Archduke Leopold at Breitenfeld, near Leipzig. In 1643 he suddenly invaded Denmark, occupied all Schleswig and Jutland, and dictated the peace of Brömsebro. In 1645 he pursued the imperial general Gallas into Bohemia, defeated a second imperialist army at Jankau, and unit-

ing with Prince George Rakoczy of Transylvania, marched upon Vienna. He returned (1647) to Sweden, where he was made a field-marshal and count of Ortala.

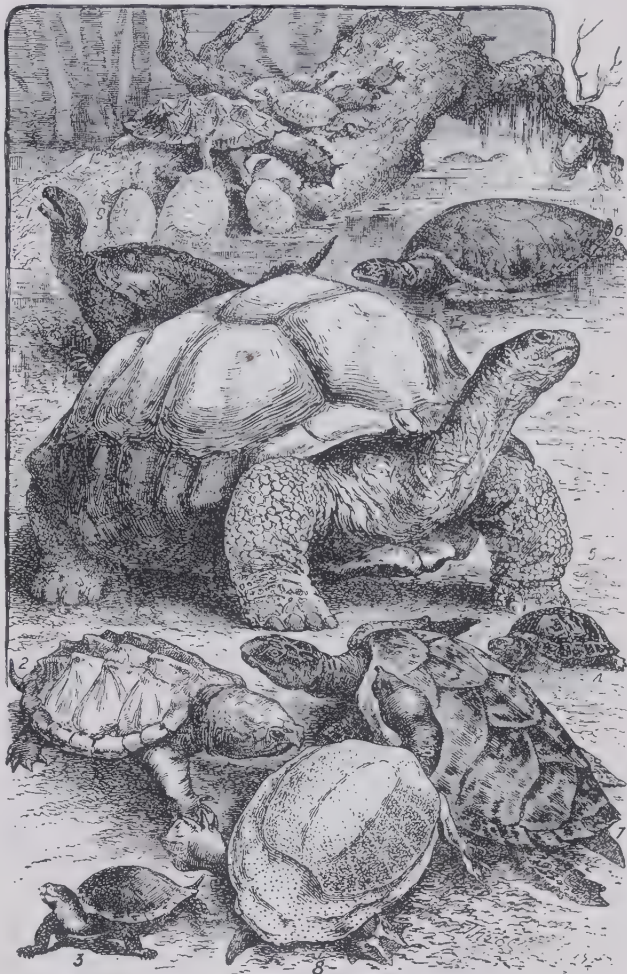
Tortoise Plant. See ELEPHANT'S FOOT.

Tortoises constitute with turtles the order of Chelonia, of the class Reptilia. Among the more important forms are the following. The leathery turtle (*Sphargis coriacea*) is a rare form found throughout intertropical seas, and has the limbs completely converted into swimming-paddles. In fresh water in the United States occur the snapping turtle (*Chelydra serpentina*) and its ally the alligator turtle (*Macrochelys Temminckii*), both powerful and vicious forms, attaining a length of three feet. The pretty little pond tortoise (*Emys europæa*) is found in southern and central Europe, and is related to the terrapins of America. The Greek tortoise (*Testudo græca*), so often kept in confinement in Britain, is an example of a land tortoise, and is herbivorous, while the pond tortoises live on a purely animal diet. Very interesting are the giant land tortoises, found only in the Galapagos Is. and in the islands of the western Indian Ocean, though now in process of extinction. To the family Cheloniidæ belong the turtles in the strict sense, which are all marine. One type is *Chelone midas*, the green or edible turtle, found throughout the Atlantic, Indian, and Pacific Oceans, and greatly prized as food. This species may have the shell four feet long, and weigh 3 cwt. The animal feeds on algae and *Zostera*, or sea-grass. Another species of the same genus is the hawk's-bill turtle (*C. imbricata*), a smaller form, of carnivorous habits, which is found throughout tropical and subtropical seas. It is this species which furnishes the tortoise-shell of commerce. Another valuable form is the turtle of S. America (*Podocnemis expansa*), which is eaten, while the eggs are collected for the sake of their oil. The soft-shelled turtles of N. America are species of *Trionyx*.

Tortoise-shell is composed of the horny shields which cover the carapace of the hawk's-bill turtle (*Chelone imbricata*). A large specimen may yield as much as 8 lbs. of the 'shell.' Each scale is beautifully marked, but is very thin, and for purposes of manufacture it is necessary to weld several together. This is done by heating in oil or by boiling, when the scales soften, and can be welded or moulded. The manufacture of genuine tortoise-shell ornament is carried on chiefly in the East, the finest tortoise-shell

being exported from Celebes to China.

Tortola. See VIRGIN ISLANDS.
Tortona (anc. *Dertona*), tn., Piedmont, N. Italy, 12 m. S.E. of Alessandria; has silk manufactures. Its cathedral dates from the 9th century. Pop. (1901) 17,419.



Species of Tortoises.

1. *Chelydra serpentina*. 2. *Macrochelys Temminckii*. 3. *Emys europæa*. 4. *Testudo græca*. 5. *Testudo gigantea*. 6. *Chelone midas*. 7. *Chelone imbricata*. 8. *Trionyx triunguis*. 9. *Trionyx ferox*. 10. *Chelys imbricata*.

Tortosa, city, N.E. Spain, in Catalonia, 43 m. S.W. of Tarragona, near the mouth of the Ebro. It is very picturesque, and has a long history of wars from the time of the Moors; it has also a magnificent Gothic cathedral (14th century), with the holy girdle. Pop. (1901) 24,452.

Torts, in English law, are wrongs which give rise to a civil remedy in a court of common law jurisdiction. Assault, defamation, trespass, deceit, wrongful dealing with goods, false imprisonment, malicious prosecution, negligence, and nuisance, are all torts. Some of them give

rise also to a criminal prosecution, but they are torts only in so far as they form the basis of a civil action. The main division of common law actions is into actions of contract and actions of tort. The remedies for tort are: (1) abatement, as by pulling down a gate which blocks a right

of way; (2) distress, as by seizing cattle and other animals trespassing upon land; (3) an action at law, in which damages or an injunction may be obtained. Defences to an action for tort are—inevitable accident, licence by the plaintiff, contributory negligence, self-defence, and legal authority. The plaintiff may lose his remedy by acquiescence or by accord and satisfaction. The right of action dies with the plaintiff or the defendant, unless the tort consists of the appropriation of property by the defendant, or involves the death of the party injured, and he leaves a wife, husband, parent, or child, who may sue under Lord Campbell's Act; or was a wrong affecting real or personal property committed by the deceased within six months of his death, or was committed against the personal property of the deceased or against his real property within six months of his death.

Torture, in a legal sense, means the application of bodily pain in order to force evidence from witnesses, or confessions from persons accused of crimes. It was applied to slaves at Athens, and the Athenian and Rhodian laws allowed it to be applied even to citizens and freemen. The use of torture had become fully established in the time of the early emperors. At a later period the earlier restrictions were wholly removed or greatly modified. Previous to the 13th century, no trace of the use or permission of torture is to be found in the canon law. The first trace of any ecclesiastical sanction of this mode of proceeding, even in the case of heresy or apostasy, is found in a decree of Innocent iv. in 1252. Judicial torture formed a part of all the legal systems of Europe which adopted the Roman law, especially France, Germany, and Scotland. In France torture was partially abolished by Louis xvi. in 1780, and completely prohibited in 1789. Evidences of the torture employed in Germany during the middle ages exist in the torture chambers and instruments exhibited at Nuremberg, Salzburg, and Ratisbon. Torture was unknown in England until 1310, when certain Templars were tortured. Henceforth it was almost uninterruptedly practised until the year 1646, when it ceased. In Scotland the use of torture prevailed until the year 1708. Among the principal instruments of torture were the 'iron maiden of Nuremberg,' the rack (introduced into England by the Duke of Exeter—thence called 'the Duke of Exeter's daughter'), the 'seavenger's daughter' (a corruption of Skeffington's daughter), thumb-screws, pincers, and manacles.

In Scotland the instruments were the boots, the thummikins, the pinniewinks or pilliwinks, the caspitaws or caspicaws, and the tosots, several of which were in use within twenty years of the abolition of torture in that country. See Jardine's *Torture in the Criminal Law of England* (1837), and Andrews's *Punishments in the Olden Time* (1882).

Toru Dutt. See DUTT, TORU.
Torula. See YEAST.

Tory, like the corresponding term 'Whig,' was originally applied in derision and contempt. It was at first the designation of Irish Roman Catholic outlaws and robbers, and it is usually said was not applied in politics till the time of the Popish Plot (1678). The term, however, had acquired a political significance at a much earlier date. It is used by Principal Baillie of Glasgow University, in a letter, dated 1654, to his correspondent the Rev. Mr. Spang in Holland, and applied by him to the forces which endeavoured to maintain the cause of Charles II. The term is also used, but not so clearly in a political sense, a few years later in the minutes of the Convention of Royal Burghs. The term Tory, as the political counterpart of Whig, was used from the revolution to the time of the Reform Bill of 1832, when it began to be superseded by Conservative; but it has never suffered such a complete eclipse as the term Whig. An attempt to revive its use to indicate a Tory Democrat was not successful. In American politics Tory was applied to the loyalists at the time of the war of independence, and the name has in the United States carried obloquy.

Torzhek. See TORJOK.

Tossing the Caber. See ATHLETIC SPORTS.

Tosti, FRANCESCO PAOLO (1847), Italian musical composer, born at Ortona-sul-Mare, in the Abruzzi. In 1870 he was appointed singing master to the queen of Italy. He first visited England in 1875, and became teacher of singing to the royal family in 1880. He has a European reputation as a song-writer, and amongst his well-known compositions are *Come to my Heart*, *Good-bye, That Day, Mother, For Ever and for Ever*.

Tostig, (d. 1066), son of Earl Godwin, was appointed Earl of Northumbria by Edward the Confessor (1055); assisted Malcolm III. of Scotland against Macbeth; joined his brother Harold in the invasion of Wales, but his tyranny alienated the Northumbrians, and he was deposed, and escaped to Flanders. He was defeated and killed by Harold at Stamford Bridge.

Totana, tn., prov. Murcia, Spain, 10 m. N.E. of Lorca; exports lemons. Pop. (1900) 13,703, including a large number of Gypsies.

Totem (lit. 'a family or tribal sign'), a term applicable to the symbols of all those races among whom totemism exists. Viewed in one aspect, the totem is distinctly heraldic. Mr. J. Deans, in his *Tales from the Totems of Hidery* (1899), shows that among the Haidah Indians not only has each man his individual totem, carved on a totem pole before his house, but a rich man or chief adds to the single totem 'all his crests and all the stories connected with them.' 'This very extraordinary institution, whatever its origin,' observes Mr. Andrew Lang of totemism (*Myth, Ritual, and Religion*, 1901, p. 60), 'can-



Totem Poles from Indian Grave at Klinkwan.

not have arisen except among men capable of conceiving kinship and all human relationships as existing between themselves and all animate and inanimate things. It is the rule and not the exception that savage societies are founded upon this belief.' The great majority of totems are beasts, birds, and fishes, although trees and plants, the wind, the rain, the sun, the moon, and the stars are selected. As the natural object represented by the totem is believed to be the actual ancestor of those who wear that cognizance, one result is that the latter are forbidden to kill or eat the animal in question—where the totem is that of a living creature. Similar prohibitions attach to intermarriage and blood-feud between those of the same totem. In his work on *The Native Tribes of South-East Australia* (1904) Mr. A. W. Howitt shows that these people have an elaborate and carefully-considered totemic system, which prevents a man from marrying a woman too

nearly related to him in blood. Brother and sister possess the same totem; and those of the same totem, even although not known relatives, dare not intermarry. Any violation of this law is punished by death. The complex question of totemism has been much studied by anthropologists ever since it was discussed by J. F. McLennan in the *Fortnightly Review* (1869-70). Special mention may be made of Dr. Frazer's *Totemism* (1887) and Mr. Lang's *The Secret of the Totem* (1905).

Totila, or **BADUILA** (d. 552), king of the Ostrogoths, succeeded to the throne in 541, and at once continued vigorously the war against Justinian, emperor of Byzantium—a war begun six years before. Although his principal opponent was Belisarius, he speedily captured Beneventum (542), Asculum or Ascoli (545), Piacenza (546), and many other cities, and attacked Rome (546), which he at length captured after a siege of several months. Belisarius was then recalled, and Totila seized the opportunity to invade Sicily (550); but before he was able to effect the conquest of the island, he was recalled to Italy by the arrival of the Byzantine general Narses, whom he endeavoured to stop in the Apennines, but was defeated near Gualdo Tadino (Procopius calls it Taginæ), and slain whilst attempting to escape.

Totnes, munic. bor., Devonshire, on the Dart, 10 m. N.W. of Dartmouth. Ancient buildings are the church, a Norman keep, the guildhall, and two town gates. Cider is made. Pop. (1901) 4,035.

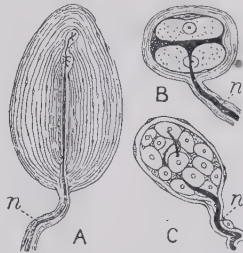
Toucan, a southern constellation located by Bayer in 1603 to the south of Phoenix.



Toucan.

Toucans (Rhamphastidæ), a family of South American birds, which, on account of the shape of the bill, were formerly believed to have some relation to the hornbills; their nearest allies are, however, the honey-guides and barbets. The bill is enormously

large, but is without the helmet seen in the hornbills. The plumage is long and loose, and, like the huge bill, is brilliantly coloured. The legs are short and strong, and of the four toes two are directed forwards and two backwards. The tail is capable of very free motion, and when the bird sleeps is always directed forwards over the back. The food consists chiefly of fruits and seeds, but insects, small birds, eggs, small mammals and reptiles seem also to be eaten. The birds are gregarious, flying in small flocks, and post sentinels when they feed. The cry is very noisy. Toucans are easily tamed, and make amusing pets; the flesh is eaten in S. America. An example is *Rhamphastes ariel*.



Touch—Nerve-endings.

A. Pacinian corpuscle. B. Touch corpuscle from duck's tongue. C. End-bulb from human conjunctiva. n. Entering nerve-fibres.

Touch. The physiological basis of touch sensation is a highly complicated nerve-ending or tactile end-organ. These are distributed over the whole area of the skin, more densely in some places than in others. Subjectively, tactile sensation varies in different parts. This is tested by E. H. Weber's method, which is based on the fact that two points on the skin are felt as two only when the distance between them is a certain measured minimum. At the tongue-tip they are felt as two if they are $\frac{1}{4}$ in. apart, but on the back of the hand they must be $1\frac{1}{2}$ in. apart, and so in varying distances for different localities. The delicacy of discrimination can be increased by practice. Touch sensation may be passive, as in sensations of pressure; or active, as in sensations of resistance or weighing—these sensations involving movement. Surfaces are discriminated by touch as hard or soft, rough or smooth. Touch with movement is the basis of our experience of extension, which includes form, and therefore solidity, which is form with resistance. See James Ward's 'Psychology,' in *Encyc. Brit.*, and Stout's *Manual of Psychology*, vol. ii. (1896).

Touch-me-not, a British annual plant (*Impatiens Noli-metangere*) belonging to the natural order Balsaminaceæ. It derives its specific and popular name from the elastic valves of its seed-pods, which violently eject the seeds at the slightest touch.

Touchstone, a device for roughly ascertaining the purity of gold alloys. It consists of a smooth strip of hard black stone, on which a corner of the alloy is rubbed so as to leave a streak, which is then moistened with an acid composed of 78·4 per cent. nitric acid, 1·6 per cent. hydrochloric acid, and 20 per cent. of water. By comparing the effect with that produced on streaks made with alloys of known composition, an approximation to the gold content of the alloy is found.

Touchwood, a soft, whitish substance produced in wood by the action of certain fungi, especially of *Polyporus igniarius*. It burns like tinder if a spark be dropped on it; hence its popular name.

Toul (anc. *Tullum Leucomor*), fort. tn., in an entrenched camp, dep. Meurthe-et-Moselle, France, on l. bk. of Moselle, 14 m. W. of Nancy. It has manufactures of earthenware, hats, embroidery, and lace. Among its buildings are the very fine church of St. Etienne (begun in the 10th century, and formerly a cathedral) and the Gothic church of St. Gengoul. It surrendered to the Germans on Sept. 23, 1870, and since then its fortifications have been greatly increased. Pop. (1901) 12,287.

Toulon, seapt. tn. of France, dep. Var, stands on the Mediterranean, 42 m. E.S.E. of Marseilles, with an excellently sheltered double harbour (an outer and an inner). It was early a place of maritime trade, and is now France's chief naval port and arsenal on the Mediterranean. Strongly fortified heights rise round Toulon on every side, rendering it extremely strong. The commercial port and town lie on the N.E. side of the inner harbour, and the latter contains the cathedral (11th to 12th century). The commerce is of small importance. On the W. side of the inner harbour, which is dredged to a uniform depth of 33 ft., lie the naval dockyard, arsenal, and nautical museum. There is a dock area of 740 acres, with 80 acres of deep-water floating docks, which will hold the largest ships. Toulon was the Greek Telonion and the Roman Telo Martius. In the 17th century its arsenal and dockyards were begun by Vauban. Both were destroyed by the British in 1793. Pop. (1901) 101,602.

Toulouse, tn. in S.W. France, 160 m. S.E. of Bordeaux, was the ancient capital of Languedoc, and is the capital of the modern department of Haute-Garonne. Lying in the middle of the great plain of Gascony and Languedoc, it has good communication by river and 'lateral' canal down the Garonne; by railway, through the Aude valley, with the Mediterranean coast; and, by the Canal du Midi, with Cette and the Rhone mouth. Its special manufactures are silks, woollens, leather, copper, and cannon. The town, which is built on both sides of the Garonne, contains several interesting build-

ington defeated Soult. It was the birthplace of the juriscult Cujar (1522-90); Abbé Huc, the missionary explorer (1813-60); Esquirat, the lunacy doctor (1772-1840). Pop. (1901) 149,841.

Toung-ngu, tn., Burma, on the Sittang, 70 m. E. by N. of Prome. Pop. (1901) 17,120.

Touraco, one of the many names given to the hoatzin.

Touraine, anc. prov. of France, now forming dep. Indre-et-Loire and part of Vienne. It was known as the 'garden of France.' Tours was the capital. At first ruled by its counts, Touraine was in 1044 ceded to Anjou, and with it formed part of the French pos-

Tourmaline, a mineral of complex composition, containing aluminium, boron, sodium, iron, magnesium, fluorine, silica, and water as its principal ingredients. The commonest forms are six-sided prisms capped by obtuse pyramids; the faces exhibited by opposite ends of the crystals do not correspond (hemimorphy), and the crystals when heated become electrified. The lustre of the mineral is vitreous, the cleavage imperfect (sp. gr. 3.1), and the hardness equal to 7. Common tourmaline or schorl is black, and occurs as grains, fibrous masses, or radiate aggregates, which are very common in some granitic



Toulouse: General View.

ings, among them the Romanesque church of St. Sernin (Saturnin), consecrated 1096, and the cathedral of St. Etienne (13th century). The museum contains the ivory horn of the renowned paladin Roland. Toulouse is the seat of a medical school, an archbishop, and a university. Known as Tolosa to the Romans, it was in the 5th century a Gothic capital; between 920 and 1271, under the counts of Toulouse, who made it a centre of Provençal troubadours; reunited to France under Philip the Bold (1271); the scene of Huguenot massacres in 1562 and 1572, and of Albigenian persecutions. Here, in 1814, Wel-

sessions of the Plantagenet kings of England. It passed back in the 13th century, and was incorporated with France in 1584.

Tourane, seapt. of Annam, French Indo-China, 52 m. S.E. of Hué. Here the whole import and export trade of Annam is centralized. The principal exports are edible birds' nests. Coal mines are worked. Pop. 4,500.

Tourcoing, tn., dep. Nord, France, 2 m. N.N.W. of Roubaix, and 7½ m. N.N.E. of Lille; has very important wool manufactures. Cottons and velvet pile carpets are also made. Pop. (1901) 79,243.

Tourgeniev. See TURGENIEV.

countries (Cornwall, Saxony, Straits Settlements, Queensland). With quartz it forms schorl-rock, and when felspar is also present tourmaline granite or schorlaceous granite. Schorl occurs also in pegmatites and some schists. All, except the colourless varieties, are intensely dichroic; and this property not only serves to distinguish tourmaline from other precious stones, but also makes it of use for optical purposes. If two plates of black tourmaline be mounted, so that they can be rotated in their setting, light which passes through one will be transmitted by the other so long as their axes are parallel, but will be entirely absorbed if

the axis of the second be at right angles to that of the first. This is the principle of the optical instrument known as the 'tourmaline tong.' Blue, green, and red varieties of tourmaline are less dichroic than the brown and black. The blue (*indicolite*) may closely resemble the sapphire. The red (*rubellite*) is found in Siberia, the United States, and Ceylon, and when of good colour is used for jewellery. It is sometimes called the Siberian ruby. Fine green crystals from Brazil have earned the name of Brazilian emerald; a yellow variety is the peridote of Ceylon; achroite is colourless tourmaline.

Tourmente, a sudden snow-storm that occurs from time to time in the Alps, and is much dreaded by chamois hunters and mountaineers. A similar visitation in the Andes is designated by the Spaniards *temporale*.

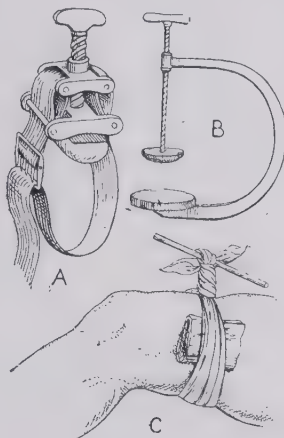
Tournai (anc. *Tornacum*; Flem. *Doornik*), tn., prov. Hainaut, Belgium, on the Scheldt, 11 m. E.S.E. of Roubaix. It has manufactures of hosiery, carpets, woollen and cotton goods, and a magnificent cathedral of Notre Dame, containing pictures by Rubens. Pop. (1901) 35,004.

Tournament, or **JOUST**, a species of combat in the middle ages, in which the parties engaged for the purpose of exercising and exhibiting their courage, prowess, and skill in arms on horseback. It took its rise after the establishment of the feudal system. Its invention is ascribed by some to the Emperor Henry, 'the Fowler,' who died 936; and by others to Geoffrey de Preuilly, who died in 1066. Tournaments are said to have been first practised by the English in the time of Stephen, but they were not greatly in vogue till the reign of Richard Cœur-de-Lion. The institution continued to flourish from that time down to the middle of the 16th century. The accident of Henry II. of France meeting his death at a tournament (1559) occasioned the cessation of the practice everywhere. Details of the forms and ceremonies observed in fixing the lists, in offering, and accepting the challenges, in declaring the issue of each encounter, and in assigning and bestowing the prizes, together with the usual laws and mode of fighting, will be found in Froissart and other old chroniclers, Chaucer's *The Knight's Tale*, Scott's *Ivanhoe* or his *Essay on Chivalry*, and Hume Brown's *Early Travellers in Scotland* (1891). A tournament was held in Scotland at Eglinton Castle in 1839, with Lady Seymour as the Queen of Beauty, and Napoleon III. one of the spectators.

Tournament, THE LAST. See IDYLLS OF THE KING.

Tournefort, JOSEPH PITTON DE (1656-1708), French botanist, born at Aix in Provence, and after travelling over Europe became (1702) professor of the College of France at Paris. He was the first to group plants into genera. His chief works are *Éléments de Botanique* (1694) and *Institutions Rei Herbariæ* (1700).

Tourneur, CYRIL (1575-1626), English dramatist. His early life was spent in writing plays, and panegyrics on Vere and the Cecils. About 1613 he obtained employment in Holland, and some years later accompanied the Cadiz expedition as secretary to Cecil. Tourneur's best-known play is *The Revenger's Tragedy*. He wrote also *The Atheists Tragedie*, *The Nobleman*, and *The Transformed Metamorphosis*. A collected edition of his *Works*, by J. C. Collins, appeared in 1878.



Forms of Tourniquet.

A. Petit's tourniquet. B. Lister's tourniquet for aorta. C. Extemporized tourniquet.

Tourniquet, a surgical instrument employed to compress an artery, and thus to arrest or control hemorrhage. A form of tourniquet was used by F. von Hilden (d. 1634) by placing a piece of wood under the bandage; the usual form was devised by a French surgeon, Morel, at Besançon, in 1674. But the use of this, and of the similar Petit's tourniquet, has in many hands given way to an elastic tourniquet used with Esmarch's bandage. The older instrument consists of a pad which is placed over the blood vessel, and a band which surrounds the limb. By means of a screw the band is tightened and sufficient pressure is brought to bear upon the pad to occlude the vessel. An extempore tour-

niquet may be improvised from a pocket handkerchief knotted round a limb. Pressure is applied by rotating a short stick passed under the knot, pinching of the skin being avoided by placing a soft pad under the twisted portion of the handkerchief. A tourniquet must be applied over the artery at some point between the wound and the heart, and great care must be taken that the tissues do not suffer from too prolonged deprivation of their blood supply.

Tours (anc. *Casarodunum*), formerly cap. of old prov. of Touraine, and now cap. of dep. Indre-et-Loire, France, on l. bk. of Loire, 145 m. by rail s.w. of Paris; has manufactures of steel and iron goods, glass and earthenware, and chemicals. Its printing works are not so important as they were. Its 12th-century cathedral contains a beautiful monument to the children of Charles VIII. The ruins of Plessis-Tours are in the vicinity. In 732, Charles Martel defeated the Saracens near Tours. Pop. (1901) 64,695.

Tourville, ANNE HILARION DE COTENTIN, COMTE DE (1642-1701), French admiral, born at Tourville. He distinguished himself as a captain at Agosta (1676), commanded the vanguard at Palermo (1677), made several successful expeditions against Algerian pirates (1682-8), was beaten by a Dutch-English fleet off La Hogue (1692), but destroyed a valuable merchant convoy under Sir George Rooke off Cape St. Vincent (1693). See the spurious *Mémoires de Tourville* (1742), and Delabre's *Tourville et la Marine de son Temps* (1889).

Toussaint l'Ouverture (1743-1803), West Indian revolutionist, born in Haiti; was originally a black slave, who in 1794 joined the French republicans, carrying with him the whole body of negroes, and was then made commander-in-chief of the island, the British and royalists clearing out in 1798. He afterwards became president, and raised the island to a surprising height of prosperity. Bonaparte eventually forced him to capitulate, and he was sent as a prisoner to France, and died in captivity.

Tower. See CAMPANILE.

Tower Bridge. See LONDON.

Tower of London, on the N. or l. bk. of the Thames, was from a very early period employed as a state prison, and was the place of execution of those who were condemned to death for high treason and other state offences. It consists of a keep 90 ft. high, called the White Tower; and, while tradition assigns to Julius Cæsar the commencement of it, it is usual to date its forma-

tion from the time of William the Conqueror (c. 1070). It is surrounded by towers of lesser note, barracks and armouries, and the whole area extending to about 13 acres is surrounded by a moat. The Tower was sometimes used by Henry III. as a residence; and the Chapel of St John within the White Tower is one of the best examples of Early English architecture in England. The Traitor's Gate, giving water access from the river, dates from the time of William Rufus, as also does St. Thomas's Tower. The regalia of England is now housed within the Tower. The Tower contains a military garrison, and is commanded by a military officer with the title of constable. See Gower's *The Tower of London* (1901).

Town Council, the governing body in a municipal corporation elected by the ratepayers. Their chief duties are to manage the property of the burgh, impose rates for public purposes, make bye-laws, etc. The members are elected for three years, a third retiring annually, but are eligible for re-election. Their chairman or president is styled a mayor in England and a provost in Scotland, and their magistrates aldermen in England and bailies in Scotland.

Towneley, CHARLES (1737-1805), English collector of classical antiquities, was born near Burnley. A visit to Rome in 1765 converted him into an enthusiastic collector of marbles. By means of excavations carried on in Rome, he was able rapidly to make an almost unequalled collection, which he housed in London after 1772. At his death his collections became the property of the British Museum by purchase (£28,000).

Towneley Mysteries, religious dramas which derived their title from the manuscript containing them and belonging to P. E. Towneley. They are believed to have been performed at Widkirk Abbey, in Yorkshire. In 1836 they were printed for the Surtees Society, under the editorship of John Lingard, Joseph Hunter, and J. Stevenson, and were also edited by George England for the Early English Text Society in 1897. They are akin to the Chester Mysteries and the Coventry Mysteries.

Town Refuse. See REFUSE DISPOSAL.

Townshend, CHARLES, SECOND VISCOUNT TOWNSHEND (1674-1738), English statesman, was born at Rainham, Norfolk; and although brought up to Tory principles, he went over to the Whig side. In 1709 he visited the Hague as ambassador to the States-general, and signed the

Barrier treaty with them, ratifying the Hanoverian succession (1710). Townshend took part in arranging for the accession of George I., and was appointed secretary of state for the northern department (1714), holding this office thereafter, except for the years 1716-20. He was a friend and ally of Walpole. Townshend introduced into England the use of turnips and clover.

Townshend, CHARLES (1725-67), English statesman, grandson of the second Viscount Townshend, was a contemporary of Wilkes at Leyden University. He entered Parliament as member for Great Yarmouth in 1747, and became successively lord of the Admiralty (1754), treasurer of the Chamber (1756), and secretary of war (1761). After resigning office in 1763, he opposed Grenville's administration; but on the return of Pitt to power in 1766, he became chancellor of the Exchequer and the most powerful minister in the House of Commons. It was Townshend who introduced those measures for obtaining revenue from America which led to the revolt of the colonies. He was a man of brilliant abilities, but with grave faults of character. See *Life* by Fitzgerald (1866).

Township, or VILL, appears to have been the name both of the territory of the earliest form of rural community and of that community itself. The lands of the township were originally allotted to the townsmen annually, and after the harvest returned into common. The township had a corporate status, and was governed by bye-laws made by the moot. No one could be admitted to the community except by its consent, or by unchallenged residence for a year. In later times the township came under two influences—that of the feudal jurisdiction of the manor, and that of the ecclesiastical jurisdiction of the parish—and in the event the latter became predominant. In the north of England the township still survives to a certain extent.

Townsville, munic. tn. and episc. see, on E. coast of Queensland, Australia, 870 m. N.W. of Brisbane, cap. of the northern part of the state, and the port for important mining districts and the pastoral country of the interior plains. The harbour will accommodate vessels drawing 20 ft. of water. There is a new episcopal see, and the industries include iron foundries and manufacture of soap, ice, stationery, and beer. Pop. (1901) 12,717.

Townson, JOHN THOMAS (1804-81), English scientific writer, was born at Devonport, and became

a chronometer-maker. After effecting improvements in the daguerreotype process, he turned his attention to navigation, and promulgated the idea of great-circle sailing. He was appointed examiner of masters and mates at Liverpool, and there devoted a great deal of attention to the deviation of compasses on board iron ships.

Towton, battlefield, W. Riding, Yorks, 3 m. S. of Tadcaster. Scene of a Lancastrian defeat (1461).

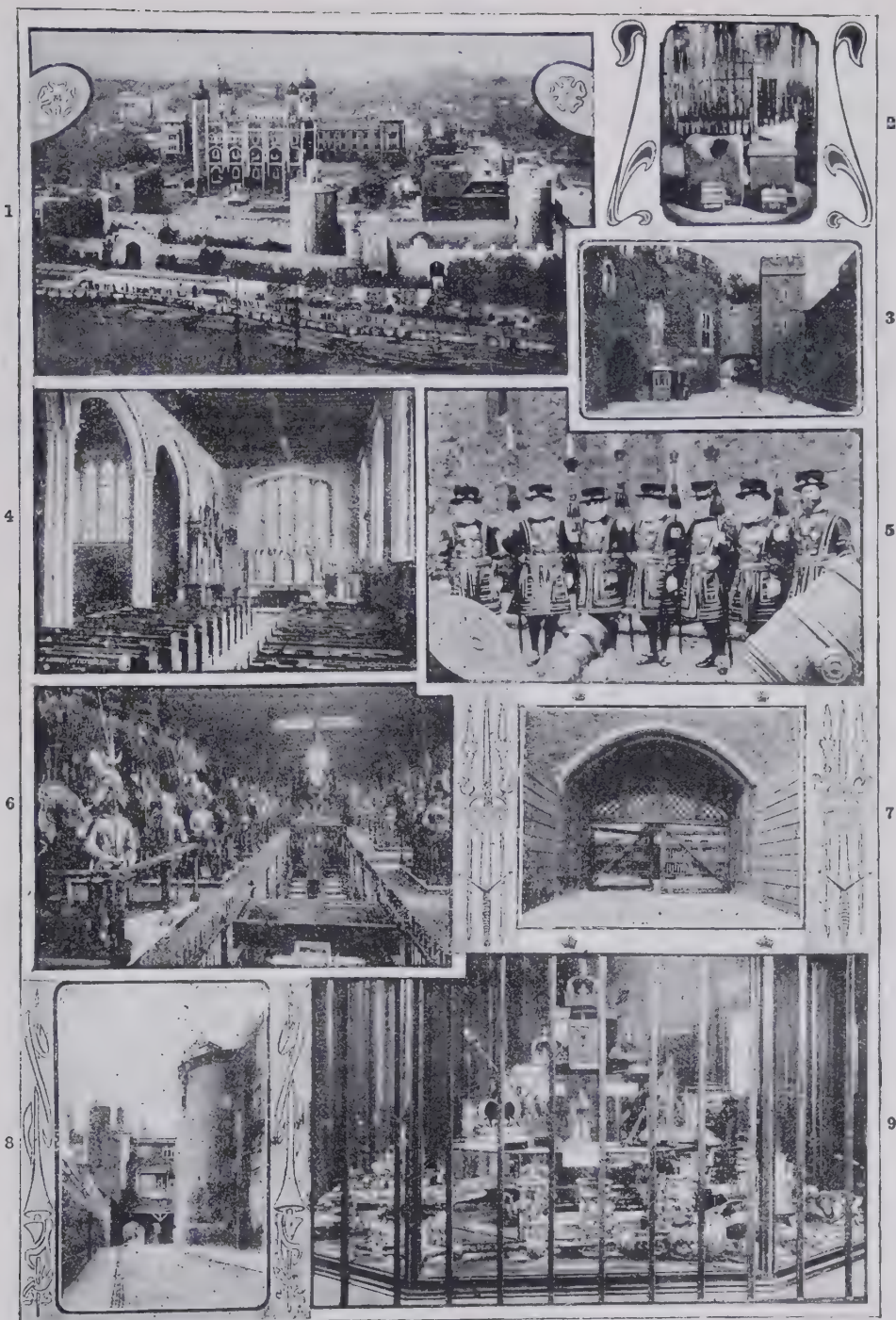
Toxicology, the branch of medical science which deals with poisons and their antidotes, and with the effects of excessive doses of medicinal agents. Toxicology derives much of its importance from crime and from criminal attempts, and it therefore falls within the scope of medical jurisprudence as well as of medicine.

Toxins. See SERUM and SEPTICÆMIA.

Toynbee, ARNOLD (1852-83), English social economist, was born in London, and became tutor at Balliol College, Oxford (1878). Toynbee flung himself unreservedly into every scheme for improving social conditions, and his influence had a marked stimulus on charity organization, co-operation, and friendly societies. *The Industrial Revolution* (1884) comprises the majority of his lectures and writings, with the exception of two lectures on 'Progress and Poverty,' delivered in 1883. In 1875 Toynbee went to live in Whitechapel, London, associating himself with Canon Barnett's work there, and died of overstrain. In his memory was organized Toynbee Hall. See *Life* (1889) by Montague.

Toynbee Hall, Whitechapel, London, was founded, 1884, by Canon Barnett and others, and called after Arnold Toynbee, with a view to the social improvement of E. London. It contains rooms for about twenty residents, chiefly Oxford and Cambridge graduates, disposed to share the life of the East End poor.

Toys, playthings for young children, sometimes designed for instruction as well—e.g. kindergarten toys. Egypt, in her tombs, has furnished jointed dolls, puppets, balls, crocodiles with movable jaws; Rome also, dolls, miniature vases, bows and arrows, hoops, tops (*Æneid*, vii. 378), marbles; Greece, an automaton flying dove, invented by Archytas; Cyprus, clay dolls, horsemen, cars with four horses abreast. A writer of the renaissance period (1587) mentions wooden horses, marbles, drums. The earliest English patented toy (1672), invented by John Wells, represented artificial horses, followed a century later (1788) by Hol-



The Tower of London.

1. General view from top of Tower Bridge. 2. The axe and block. 3. Bloody Mary and Wakefield Tower. 4. St. Peter's Church. 5. Warders in state dress ('Beefeaters'). 6. Horse Armoury. 7. Traitor's Gate. 8. Bell and Beward Towers. 9. The Regalia. (Photos 1, 2, 5, 7, 9 by King; 3, 4, 6, 8 by Frith.)

man's marble-making machine, and in 1817 by Sir David Brewster's kaleidoscope. Since 1852 patents have come thick and fast, especially in France. Whilst England remains supreme in the best wax dolls, rocking-horses, boats, locomotives, cannon, great quantities of toys are made on

Marburg (Hesse-Nassau), musical toys; Biberach (Württemberg), metal; Switzerland, wooden châteaux; Paris, balloons, watches, jewellery, automata; Brandenburg, cheap tin articles; Birmingham, wooden locomotives with iron wheels, brass cannon; Willenhall, cast-iron pistols; Hornsey, tin-



Toynbee Hall.

1. Reception room. 2. Entrance. 3. Courtyard.

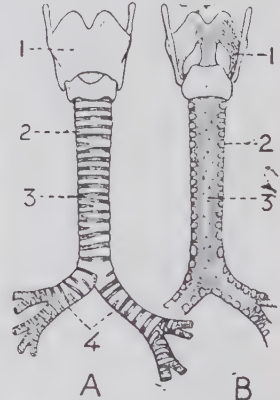
the Continent and in the United States. St. Ulrich, near Botzen (S. Tyrol), is famed for wood-carving. Sonneberg (Thuringia) produces some twenty-four million articles, representing £800,000 annually. Lauscha manufactures toys of glass; Nuremberg, cheap wooden and magnetic floating toys; Saxony, wooden animals;

zinc soldiers; Gloucester, tops; Chesham, spades; and Bradford, dolls' hair. Leipzig has a ten days' toy fair. See George C. T. Bartley's *British Manufacturing Industries* (1892), Lukin's *Toys and Toy-making* (1881), and L. Clarétie's *Les Jouets* (1894).

Toy Terrier. See BLACK-AND-TAN TERRIER.

Tracery, the stone framework in the head of Gothic windows, formed by a continuation of the mullions, bent, as it were, into ornamental designs. It was at first confined to circles and other geometrical forms; but later the lines were free and more flowing, except in the Perpendicular style, in which the mullions were carried right through in straight lines.

Trachea, or WINDPIPE, is a nearly cylindrical tube, composed of cartilaginous and membranous tissues, and extending downwards from the lower part of the larynx to the level of the third dorsal vertebra, where it bifurcates into the two bronchi. It is about four and a half inches in length and about three-quarters of an inch in diameter. It lies upon the oesophagus posteriorly, and is in relation with the carotid arteries, the thyroid gland and its vessels, and the recurrent laryngeal and pneu-



Trachea.

A. Front view. B. Back view. 1, Larynx; 2, cartilages of the trachea; 3, fibrous membrane; 4, bronchi.

mogastric nerves. In cases of laryngeal obstruction life may be saved by the operation of tracheotomy, in which the windpipe is opened and a curved metal tube inserted into the wound, so that respiration may be carried on even though the larynx be wholly occluded.

Trachonitis, the Greek name of a region of Palestine which extended from the Sea of Galilee N.E. towards Damascus. The country is mountainous, and formed a natural division of the country of Bashan. After Trajan formed the province of Arabia, early in the 2nd century A.D., it formed part of that province.

Trachyte. The trachytes are a group of hemi-crystalline igneous rocks, which occur principally as lavas, but also as intrusive sheets and laccolites, and in dykes

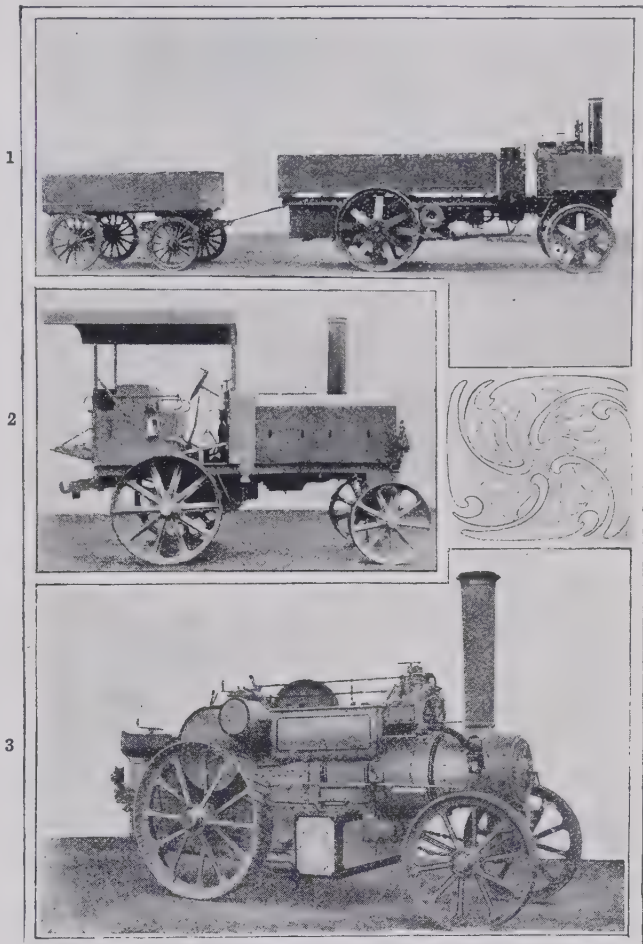
and necks. They consist essentially of alkali felspar (usually as sanidine), with a small amount of plagioclase, biotite, hornblende, or augite. The nepheline trachytes, which contain nepheline, are a connecting link between this group and the phonolites. Most trachytes are yellow or flesh-coloured; but some are dark brown or red, especially when weathered. Often they have a very coarsely porphyritic structure (e.g. Drachenfels trachyte), with crystals of sanidine one or two inches in length lying in a fine matrix. A few are vitreous. Trachytic rocks are commonest in volcanic regions (Auvergne, Naples, Ischia, Hungary, west of N. America, Ascension), but are found also among older rocks, where eruptive activity has long been extinct (N. Berwick and Pentland Hills in Scotland).

Tractarianism, otherwise known as the Oxford movement, from the place of its origin, originated in 1833 in a controversy which arose in the Church of England regarding, roughly speaking, the position the church would occupy in the event of its disestablishment. The discussion, in which Pusey, Newman, and Keble figured prominently, was conducted by means of the publication of *Tracts for the Times*, ninety in all (of which the most famous was the ninetyeth), from which the movement had its name.

Traction Engines are designed for drawing loads on roads or across country. They must be prepared to climb gradients of at least 1 in 10, and frequently on a surface which sinks somewhat beneath the weight of the engine, thus presenting a continual slope upwards in front of the wheels. The speed is never more than eight miles an hour, so that, instead of the driving wheels being directly driven from the piston-rod, as in the case of a locomotive, power is communicated by a system of spur-gearing. This allows of a much greater tractive force being developed for each H.P. of the engine, and also permits of the introduction of differential gearing for two or three speeds. The driving-wheels of a traction engine are of large diameter (from 5 ft. 6 in. to 7 ft. 6 in.), and form the rear pair. The width of tyre ranges from 15 in. upwards, and the bearing surface of the tyre is fitted with raised diagonal strips of metal, to minimize slipping. An engine of the gross weight of ten tons, with two-thirds of the weight on the driving-wheels, should have a width of tyre of 16 in., in order to avoid risk of injury to the macadam of roads. The leading pair of wheels are of about two-thirds the diam-

eter of the rear (driving) wheels. Their axle is capable of being turned about a central pivot, so that the engine may be steered; radial motion is communicated to it by means of a chain from a spur-driven transverse shaft under the boiler. Usually attached to the main axle is a winding drum, by which heavy loads may be

effect under favourable circumstances a saving of from 20 to 30 per cent. in fuel and water, with a corresponding increase in the life of the fire-box and boiler. Generally speaking, it may be taken that on roads of ordinary character, for loads less than 2½ tons, horse power is cheaper than steam haulage. For loads much



Traction Engines.
1. Thornycroft steam wagon, War Office prize winner. 2. Thornycroft 25 h.p. tractor, with two-cylinder paraffin internal combustion engine, as supplied to the War Office. 3. Aveling and Porter's compound steam motor tractor for fast hauling.

drawn up bad hills on a wire rope, the engine having previously ascended, light, to the top. A heavy fly-wheel and a high-speed governor are provided. Small traction engines are generally driven from a single cylinder; but for heavy work compound engines with two cylinders (high and low pressure) are often, used, and

above this a large saving (40 to 50 per cent.) can be effected by the employment of steam.

Light traction engines are used for drawing ploughs and diggers, for hauling threshing-machines from place to place, and for driving them. In roadless countries, such as Queensland, Uganda, and Argentina, more powerful engines

are employed to draw trains of wagons, as well as to act as portable engines for providing power to threshing-machines, pumps, and cranes. They are frequently in these cases supplied with fire boxes capable of burning wood, straw, and refuse fuel, and still of maintaining a steam pressure of 140 lb. A modern development of the use of traction engines is to provide haulage power for military purposes. During the South African war excellent service was rendered by road engines of English make. The typical engine for this purpose was a compound of 10 (nominal) h.p., with 180 lb. pressure, 3-speed gear ($1\frac{1}{2}$ to $3\frac{1}{2}$ to $4\frac{1}{2}$, and 6 to 8 miles an hour), and 7-ft. diameter driving-wheels, with tyres 24 in. wide. Each engine was mounted on laminated

The tangent LN of the tractory is of constant length a , and the curve may be drawn by making this constant tangent assume successive positions 1, 2, 3, 4, etc. The x axis is an asymptote. If x and y be the co-ordinates of a point P on the curve, the length of arc measured from the point A to P is $S = a \log_e \frac{a}{y}$, the area is $a^2 \sin^{-1} \frac{y}{a}$; or the total area included between the four branches of the curve symmetrically about the two axes is equal to that of a circle of radius a .

Tract Societies, organizations formed for the purpose of bringing home to the great mass of the people the cardinal doctrines of religious truth. The 'popular tracts,' written and issued by Wycliffe and circulated by his

kind first became possessed of superfluities—i.e. when primitive man could exist on less than his labour produced—trade began; that is to say, the advantages to be gained by exchanging these superfluities began to be realized. Kings Hiram and Solomon carried on their exchanges in regal fashion. Europe of the middle ages needed spices and cultivated a taste for the luxuries of the East; the Easterns in turn appreciated certain European productions.

History.—It is convenient to divide the history of trade into five periods. The first period extends, roughly speaking, from the earliest known times to the end of the 5th century, the end being marked by the fall of the Western Roman empire (476 A.D.). Although the trade of the East in early days cannot be referred to here, the entrances into Europe from the East must be noted; because not only are they the key to European history, but they have continued to affect trade and commerce to the present day. Beginning at the extreme north, there is practically no roadway from Asia into Europe until the southern end of the Ural Mountains is reached. Between this point and the Caspian rolls a stretch of steppe or plain. Through it came the Huns, whose invasion led to the foundation of Venice, the first great trading state in the modern sense of the term. The trade routes into Europe lie to the south of this steppe region. From India they follow the base of the Hindu-Kush and Persian mountains, into Armenia, where they bifurcate. The northern branch leads to Trebizond on the Black Sea and to Issus at the north-east corner of the Mediterranean; the southern descends the Euphrates and Tigris valleys, and converges on Nineveh and Babylon, whence, dividing again, it establishes communication with the Bosphorus and the Phœnician coast. Of these last roads that to Constantinople is important, there being a natural roadway in continuation, leading *viâ* Adrianople, Philippopolis, and Sofia, to the Danube above the Iron Gates, whence traffic passes across Europe in several directions. The last of the ancient routes from the East into Europe was *viâ* the Red Sea and the Nile valley to Alexandria. All these routes had 'road-ends'—the Bosphorus, Trebizond, the Levant ports—and it has been asserted, with much reason, that such wars as the crusades were due as much to the economic importance of holding these 'road-ends' as to religious reasons. The natural continuation of the route from the Levant ports is either up the

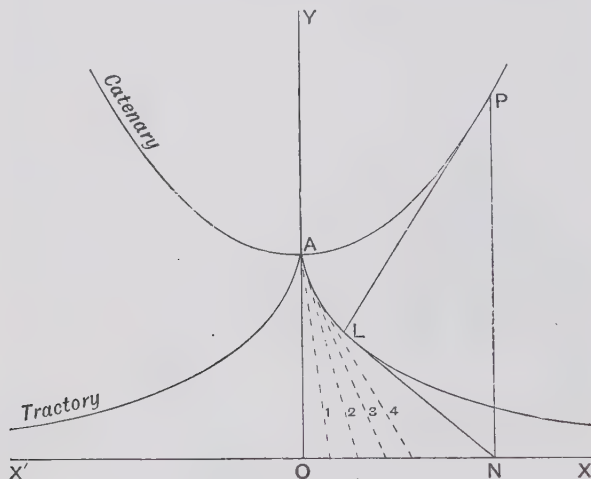


Diagram of Tractory.

springs. It used about 7 cwt. of coal in traversing 30 m., and carried 430 gals. of water, a fresh supply being required every twelve miles in ordinary country. The load hauled on active service amounted to over 30 tons. During the latter part of the war some armoured traction engines and trains were used. The engines were boxed in and completely protected (except for the wheels) with $\frac{1}{2}$ -in. plates of Krupp steel armour; and the wagons were built of special bullet-proof steel, with flap covers to the upper parts of the sides, inclined at an angle with the vertical. See also PEDRAIL.

Tractory is the curve in which a heavy particle moves when dragged at the end of an inextensible string by a body moving in a straight line. The catenary is the evolute of the tractory.

itinerant 'poor priests,' were an example. Many of these societies sprang into being after the reformation, and also after the revolution. Among the first was the Society for Promoting Christian Knowledge (1701), also the Society for Promoting Religious Knowledge among the Poor (1750), and the Religious Tract Society (1799). The British and Foreign Bible Society must also be looked upon as a valuable agency of the same kind, with its counterpart in Scotland, the National Bible Society. The *Monthly Visitor*, *Dayspring from on High*, and other leaflet publications, have an immense circulation.

Trade. Commerce and civilization have advanced hand in hand, more particularly so since the geographical discoveries of the 15th century. When man-

Adriatic to Venice, whence it continues overland *via* the Brenner Pass to Innsbruck, or up the western side of Italy to Genoa and Marseilles. Both these afford means of communication with Central and Western Europe.

The second period lasted a thousand years, down to the discovery of America and of the Cape route to India. During this period Mohammedan success, Venice, and the Hanseatic League require some special mention. While the restrictions of the canon law threatened to strangle trade and commerce, Mohammed proclaimed that such pursuits were in accordance with the will of God. Nor is it an exaggeration to say that his success was due as much to his attitude on this important subject as to either force or persuasion. The Venetians owed their rapid development and ultimate commercial supremacy to a combination of advantages, geographical and political. During the 12th and 13th centuries Venice became the great exchange mart and the centre of the carrying trade of Europe. Towards the end of these two centuries a regular cycle of trade had been established: Venetian ships carried sugar to London, whence English wool was shipped to Flanders, to exchange there for cloth, which was distributed along the line of route to the Levant, where new cargoes of Eastern commodities were obtained for the return voyage. The bulk of the profit in all these exchanges remained with the Venetians, and accounts for their rapid growth in wealth. The growth of luxury, an unwise desire for expansion on the mainland, and the discovery of the Cape route to India caused the decay of Venice—the commercial centre of the world shifting to Western Europe, and thus increasing the importance of Amsterdam, Antwerp, and London. The Hanseatic League consisted of more than one hundred towns, Wisby in the island of Gothland being one of the chief centres. This great trading confederation owed its success primarily to the organization of naval and military forces, able to defend individual traders against any existing powers. Its members gradually possessed themselves of the entire trade of the countries bordering on the Baltic—exporting their principal products to Germany, England, and all Western Europe; carrying back Western manufactures and Eastern luxuries, thus extending and completing the Venetian trade circle. The collapse of feudalism, the spread of industrialism throughout Europe, and a certain conservatism among

its members led to the decay of the league.

The third period extended from 1500 A.D. to 1776 A.D. During these three centuries interest centres in the failure of Spain and Portugal, the rise and misfortunes of Holland, and the steady growth of England. The discoveries of Columbus opened the New World to Spain, and geographical position should have resulted in maritime supremacy. But under Philip II. the Moors in Spain and the best part of the population of the Netherlands were unmercifully harried, with the result that industries capable of producing richer revenues than all the mining of the Americas were ruined. Pride and religious bigotry wrecked brilliant possibilities. During the 15th century Portuguese mariners gradually crept along the west coast of Africa, Vasco da Gama rounding the Cape of Good Hope, and reaching India in 1498. Within the next fifty years Portugal acquired trading supremacy throughout southern Asia, from Ormuz to Japan. By making use of the new Cape route, she dealt a heavy blow at the Levant and Mediterranean ports, and Lisbon became a great trade centre. But the Portuguese threw their opportunity recklessly away. Their ships brought cargoes to Lisbon, but the transhipment trade was left to English, Dutch, and Italian bottoms, with the result that Antwerp developed into an important distributing centre. Meanwhile the Portuguese concentrated their efforts on the African slave trade; agriculture and manufactures were neglected, and their colonial policy was hopelessly bad. During the later middle ages the southern Netherlands were the workshop of Europe. But connection with Spain ruined them, and drove the best elements of the population into Holland and England. The war of independence which Holland waged against Spain had a most invigorating effect on the people. Moreover, from being a purely agricultural country, the United Provinces had become a wealthy commercial and manufacturing state, whose geographical position rendered it a formidable competitor for the carrying trade of the world. Philip II. prohibited trading intercourse between Holland and the Peninsula. This compelled the Dutch to trade directly with the Indies, and became an important factor in building up their supremacy on the sea. Philip II. ruined Antwerp, whose place in the commercial world was taken by Amsterdam. French and Spanish religious persecution

drove the best business men into the United Provinces, so that Holland became the banking centre of Europe. Capital there was so plentiful that towards the end of the 17th century interest averaged 3 per cent., while in France and England it refused to go below 8 per cent. Finally, the Dutch colonial policy was liberal and successful. But England gradually assumed the command of the sea, and the navigation laws (1651) ruined the Dutch mercantile marine. Holland's American settlements were too widely scattered to admit of efficient mutual defence; thus in 1664 New Amsterdam (renamed New York) was seized by England, Dutch Guiana alone eventually remaining a permanent possession in the New World. In another sphere disaster occurred; the organization of the Bank of Amsterdam proved defective. The secrecy of the management led to abuses, which ended in the fall of what had been the greatest financial institution in Europe. Moreover, the Dutch fell a prey to a mania for speculation; hence came it that the first half of the 18th century was a time of gradual but steady decline in commercial position. The supremacy passed to England, to be shared for a time with France.

The fourth period, from 1776 to 1860, was the period of steam. The year 1776 saw the birth of modern democracy—a potent influence on trade and industry; it saw the publication of Adam Smith's *Wealth of Nations*, a book which revolutionized the attitude of mankind to economics; about the same time too James Watt succeeded in perfecting the steam-engine. Of these two events, the latter caused, the former made practicable, the industrial revolution. In the development of manufactures there have been, roughly speaking, four stages—the family system, the guild or artisan system, the domestic system, and the factory system. The industrial revolution gave rise to the last, and caused the rapid growth of densely populated manufacturing towns. Thus the history of trade from this time onward is rather concerned with the tracing of developments in methods, policy, and technique than a story of the success or failure of any one nation. It is true that England became the workshop of the world, and retained this position throughout the period; but this was due as much to the conditions of the time as to the initiative of her business men. All Europe was in the political melting-pot. America was still a new, undeveloped country, bound to agricultural pursuits. Immunity

from invasion, and great development of her mercantile marine, which gave England the carrying trade of the world, had an immeasurable effect on the growth of manufactures. Such conditions favoured the change of policy inaugurated by Peel. Raw materials were admitted free; whilst by giving in exchange manufactures produced in ever-increasing quantities by the aid of machinery, England levied a heavy tribute on the manual labour of the whole world. Bentham's doctrines were in many

space so necessary to the interests of trade, and which was completed in the next period by the telegraph and the telephone.

The fifth period dates from 1860, and is sometimes called the age of electricity, but would perhaps be better described as the age of combination. Here the laying of submarine cables, the construction of the Suez Canal, and the perfecting of the organization of both capital and labour—the former due more especially to the action of the Limited Liability Acts, the latter to the

markets of staple commodities throughout the world now work in harmony—New York being nearer to Liverpool than Manchester was prior to the invention of the telegraph. The invention of the telephone is still further modifying business methods; the responsibility of the agent is yet further reduced, whilst the personal element in business tends to be eliminated altogether. The Suez Canal, opened to traffic in November 1869, has reduced the ocean distance to India by nearly one-half,



Trade Routes from the East.

Bartholomew, Edin.

ways the complement of Adam Smith's economic work. Smith freed trade on the economic side; Bentham freed it from legal obstacles no less hampering. The work of these two men made possible the full fruition of the industrial revolution. The application of steam to manufactures and locomotion, both by land and sea, completely revolutionized trading conditions. Thus the fourth period in the history of trade saw the small industry give place to the great industry. The locomotive and the steamship commenced that annihilation of

growth of the idea of mutual support and federation among trade unions—are the chief points to be noted. The telegraph has revolutionized business almost as completely as did steam. The first cable to India was opened in March 1865; the Atlantic cable has been operating since 1866, and since then the whole world has been brought into telegraphic communication. The principal now personally regulates his business from hour to hour, in whatever part of the world it may lie, without moving from his office. The

and has had the effect of gradually restoring the old trade routes to something more than their old importance. The Mediterranean ports having suffered by the discovery of the Cape route to the East, it was generally thought that trade would revert, to a great extent, to the channels of the 16th century, whilst the Atlantic ports would suffer a check. But of the tonnage passing through the canal in 1904 no less than about 65 per cent. flew the British flag. The organization of capital and labour has completely changed the condi-

tions under which capital functions and labour operates. Unorganized labour was at the mercy of the capitalist employer, however small his operations might be. But the moment an efficient trade union appeared in any given trade, it was in a position to bargain on terms of equality with even the wealthiest *entrepreneur* of a century ago. Hence from one point of view the history of combination on both sides has been the striving of each to win a position of vantage over the other. But organization of capital has also been profoundly affected by the development of limited liability. The legislation on this subject dates back to 1855; but the present form emerged in the Act of 1862. By means of these acts the smallest capitalist is induced to invest his savings in trading concerns; and the effect, on the whole, has been an enormous stimulus to trade. The capable man, even

History (1893); Cunningham's *Growth of English Industry and Commerce* (4th ed. 1905); Guyot and Raffalovitch's *Dictionnaire du Commerce, de l'Industrie et de la Banque* (1898-1901); Mulhall's *Industries and Wealth of Nations* (1896); Schultze-Gaevernitz's *Social Peace* (1900); Townsend-Warner's *Landmarks in English Industrial History* (1899); Webster's *A General History of Commerce* (1903); and Holt-Schooling's *British Trade Year Book*.

Trade, BOARD OF, THE, is divided among several departments. The Commercial, Labour, and Statistical Department publishes the statistical abstracts, and includes the Commercial Intelligence Branch, which is that department of the original Board of Trade or 'Committee of Privy Council for Trade' which deals with information more particularly affecting British and colonial industries. The *Monthly Journal* was first published by

main branches of the Board of Trade are—the Marine Department, dealing with shipping and seamen; the Harbour Department, dealing with foreshores, harbours, foreign lighthouses, pilotage, navigation, and also with gas, water, and electric lighting orders; and the Finance and General Department, which prepares the annual estimates for Parliament, and presents the accounts of life assurance companies to Parliament, attends to the transmission and payment of seamen's wages, and performs various duties under the Bankruptcy, Patents, Designs and Trade Marks, Merchandise Marks, and Art Union Acts.

Trade Marks. The custom of using trade marks is very ancient, and the common law recognizes and protects the right of property in them. To obtain a right to a trade mark there must be a user of it, which means that the mark has been impressed upon goods, or

Statistics of Trade, from latest available returns.

	Millions of £.			Millions of tons Coal.	Millions of tons Iron Ore.	Millions of tons Pig Iron.	Millions of tons Shipping.	Thousands of miles Railways.	Thousands of miles Telegraphs.	Thousands of square miles Area.
	Imports.	Exports.	Imports and Exports.							
The British Empire..	529	351	880	256	14½	..	11½	90	170(?)	11,212
The United Kingdom	551	371	922	232	13	9	16	22	51	121
The United States...	201	278	479	306	29	16	4½	207	199	3,567
Germany	300	250	550	120	22	10	2	32	107	208
France	228	224	452	33	6	3	1	27	76	204
Belgium	157	139	296	23	..	1	..	3	4	11
Norway	16	10	26	..	..	..	2	1	8	124
Sweden	29	24	53	..	..	..	..	7	14	173
Italy	74	60	134	..	..	..	1	10	26	110
Russia	71	105	176	..	..	..	1	30	93	8,379
Japan	33	28	61	..	..	..	1	4	..	147
Spain	36	34	70	..	7	..	[826,000]	8	18	194

without capital of his own, by winning public confidence, can exercise his business genius for the common good. Hence since 1862 the old-fashioned business has been gradually dying out. Companies are taking the place of the capitalist employer, whilst the most modern phase—combination—a development which in England is probably most clearly observable in railway companies and joint-stock banks, is winning its way slowly but surely. The modern *entrepreneur* seems willing to recognize the workers as a class enjoying full economic and political equality with himself, and grasps the fact that to get the best results out of modern conditions he must countenance labour organizations and work with, not against them. Hence the establishment of conciliation boards, and similar expedients for the fixing of wages and settling of disputes without having recourse to strikes and lockouts.

Bibliography. — Ashley's *Introduction to English Economic*

the department in 1886; and under the Bankruptcy Act of 1883 certain duties, which are now more properly dealt with by other departments, were assigned to it. The Imperial Institute, the principal work of which is to display the natural resources and industries of the colonies and India, and to promote their utilization, is under the control of this department. Other departments of the Board of Trade are—the Bankruptcy Department (see BANKRUPTCY); the Companies Department, which carries out the duties connected with the Joint Stock Companies Acts, the Newspaper Law of Libel Act, etc.; the Railway Department, which inspects new railways (including tramways) before being opened for traffic, inquires into railway accidents, complaints, etc., approves by-laws, and authorizes construction of lines—its sub-department, the Standards Office, inspects weights and measures, and keeps the official standards of these. The re-

upon some wrapper or case containing goods, so that the public understands from this indication that the goods are those of a particular trader—either goods manufactured by him or selected by him, or goods which in some way or other pass through his hands in the course of trade. The trade mark then becomes part of the goodwill of a trader's business, and he will be protected against any use of his trade mark which it is reasonable to suppose will deceive the public. The protection is afforded not only as a matter of justice to the trader, but also to prevent imposition on the public. Prior to 1875 there was no means of acquiring and protecting trade marks by registration, but registration is now governed by the Patents, Designs, and Trade Marks Acts, 1883 to 1888.

A trade mark must consist of or contain one at least of the following essentials: (1) a name of an individual or a firm applied in some distinctive man-

ner; (2) the signature of the party applying for registration; (3) a distinctive device, mark, heading, label, or ticket; (4) an invented word; or (5) a word having no reference to the character or quality of the goods, and not being a geographical name. A trade mark must be registered for particular goods or classes of goods, and may be of some particular colour. The fees payable on application for registration, and on registration, are fixed by the Board of Trade. An appeal from a decision of the comptroller as to whether a trade mark can be registered lies to the Board of Trade, which, however, usually refers the case to the Chancery Division of the High Court. A trade mark will be removed from the register at the end of fourteen years unless the prescribed fee is paid, and so from time to time at the expiration of every period of fourteen years. Registration of trade marks is granted to aliens, and their rights are protected in the English courts. There are two kinds of actions brought in respect of trade marks. (1.) A statutory action to prevent infringement, and to recover damages. No such proceedings can be taken in the case of a trade mark capable of registration unless it is registered, or, in the case of any other trade mark in use before Aug. 13, 1875, unless registration has been refused. (2.) When the mark is not registered, an action may be brought to restrain the defendant from passing off his goods as the goods of the plaintiff, and damages may be recovered. Criminal proceedings may also be taken under the Merchandise Marks Acts. See Sebastian's *Trade Marks* (ed. 1890); Fulton's *Patents, Trade Marks, and Designs* (1905).

Trade Protection Societies, associations formed to safeguard the interests of those engaged in trade, and others. The earliest society of the kind was the London Association of Guardians for the Protection of Trade, founded in 1776, which collected particulars of bankruptcies and similar proceedings, the lists being available to members only. The various societies established in the 19th century in most large towns extended the scope of their operations by the collection of overdue accounts, and by the printing and circulation among the members of information with regard to the position and credit to be given to mercantile houses. The different societies in 1852 formed themselves into a central association, which meets annually in London. The association obtained a charter in 1871.

Traders' Defence Associations, bodies formed to protect the interests of individual enterprise against undue interference and restrictions by government and other inspectors, unequal taxation, municipal trading (other than gas, water, etc.), stamp trading, etc., but especially for defence against the aggression of co-operative and civil service societies. Defence associations were instituted in Scotland in 1887, and in England in 1902; and a central board, with headquarters in Manchester, was formed in 1903.

Tradescantia, or SPIDER-WORT, a genus of American herbaceous plants belonging to the order Commelinaceæ. They usually bear simple cymes of flowers with distinct sepals, obovate petals, and six stamens.

Trade Unions, 'voluntary associations of workmen for mutual assistance and protection, and securing generally the most favourable conditions for labour. This is their primary and fundamental object, and includes all efforts to raise wages, or prevent a reduction in wages; to dominate the hours of labour, or resist attempts to increase the working hours; and to regulate all matters pertaining to methods of employment or discharge, and modes of working. The sphere of their action extends to almost every detail connected with the labour of the workman and the well-being of his everyday life' (Howell, *Conflicts of Capital and Labour*, c. iii.). Success is naturally greatest in the organization of the skilled trades. The inherent difficulties of organization are shown by the fluctuation in membership, and also by the disappearance of many unions shortly after their formation. Patent community of interest is needed to give the organization coherence, and universal combinations of workmen against capitalists are likely to be short-lived. The collapse of the Knights of Labour in the United States illustrates this point.

The object for which trade unions have been formed may be expressed briefly as overcoming or offsetting the disabilities of labour. Of these disabilities the chief is that, owing to the lack of a reserve fund, the labourer cannot 'stand out, as all other sellers do, for his price.' 'The labourer must sell to-day; the employer need not buy till to-morrow. To the master it is only a question of profits; to the labourer it is a question of life' (Davidson, *Bargain Theory of Wages*). Where the employer operates with borrowed capital the advantage of his position in bargaining with his hands is, how-

ever, much reduced. But to the end he retains a decisive advantage, and to meet this the trade union endeavours to supply the workman with a reserve fund that will enable him to stand out for his price. At the same time, the labourer has to face the difficulty that, while by the assistance of the union he stands out for his price, his place may be filled by competing labour. 'The object of trade-union policy, through all the maze of conflicting and obscure regulations, has been to give to each individual labourer something of the indispensability of labour as a whole.' The power of the trade union to make the individual labourer indispensable to the employer depends (1) on the proportion of union to non-union labourers, and (2) on the discipline it can exercise over its members. Aside from these conditions, there is a definite limit to the power of unions in what Professor Marshall calls the law of substitution, which means in this case that, in the event of trade-union action being attended by a large measure of success, there would be a strong tendency on the part of employers to substitute labour-saving machinery for labour. This limit is clearly recognized, and the maxim, 'Never to press for a larger gain than is covered by the difficulty of replacing the body of present employes by outside labour' (Hobson, *Problems of Poverty*), or machinery, is the maxim of a wise policy. It is not necessary to the success of trade-union policy that the whole body of labourers should be included within the unions. As a matter of fact, trade unionists are only a small fraction of the labouring classes; except in times of strong feeling, the unions probably include only 10 or 12 per cent. of the whole, and in the United States the proportion is even less. But there always has been a tendency, which becomes most evident in time of strike, to bring pressure to bear on non-union workers to join the union. But however natural the desire may be, the exercise of pressure is not justifiable on social grounds; and the so-called associations of free labourers, were it not that they are often supposed to be carried on in the interests of the employers, are a justifiable development as a protest against the tyranny of class opinion.

Trade unionism has been well described by Mr. Sidney Webb as collective bargaining. With this end in view, trade unions oppose any scheme which would have as one of its results the separation of the individual workman from his fellow-workers.

They are not in favour of profit-sharing, and are often opposed to piece-work. Their aim is to compel employers to deal with their men collectively. Nor are they willing to permit the grading of workers according to ability; although the demonstrated result is to make it increasingly difficult for older men to obtain any work when they can no longer earn the trade-union minimum wage. The maintenance of discipline and cohesion is more difficult in times of peace than in times of industrial war; and there is always a temptation for the union leaders to use their power to strengthen their hold. The most powerful means the unions have of maintaining discipline are the benefit funds which most of the unions accumulate. Originally the benefit funds were established purely as benefit funds, but now, not only are they usually used for that purpose, but by means of deferred payment the unions retain control over their own members. A very large proportion of the funds of some of the older unions is expended on unemployed, sick, and funeral benefits.

Practically speaking, the real work of a union has failed when a strike has to be declared, for the union has not been able to safeguard the interests of its members. Attempts are sometimes made to draw up a balance sheet of a strike, showing the actual loss of wages involved, even if the strike is successful—and less than 50 per cent. of labour disputes are won by the labourers; but the direct material gains never make up for the losses of men and treasure. Only about three per cent. of the working-classes are annually involved in industrial disputes, and the best organized unions have the fewest strikes. During the last decade popular sympathy with strikes and with trade unions generally has diminished. This was partly due to the great engineering strike (1897-8) in England. The same result was brought about by the coal strike in America in 1902. There has consequently grown up the opinion that labour disputes should be settled by compulsory arbitration. To a very large extent, as Mr. Schloss shows, the working-classes in and out of the unions believe in the 'lump of work' fallacy, which regards the quantity of work to be done as fixed. With such a belief there can be no real desire to promote efficiency, and efficiency is the *mot d'ordre* of the day. The recent decision making the funds of the union liable for the mistakes of the union is regarded by many as a salutary check. The report of a

royal commission on trade disputes, appointed in June 1903, was issued in February 1906, and by a large majority was favourable to the legalizing and otherwise protecting trade unions and their funds.

The history of trade unionism is the history of industrial progress. In its modern form trade unionism was, in its inception, an organized attempt on the part of labour to protect itself against the constantly increasing industrial supremacy of capital. Historically, the combinations of workers for the protection of their interests, which constitute the unions of to-day, are sometimes shown to be lineally descended from the trade guilds of early times. Tentatively, however, it may be asserted that the similarity between them ends with the similarity of motive—*viz.* co-operation for the protection of mutual interests. The scope of the guild was wider, and embraced the regulation of the conditions for the advantageous propagation of the industry it represented. The union, on the other hand, is founded practically on a polemic basis, and its object is the regulation of what it considers to be fair conditions between employer and employed. It is a product of the times, and an outcome of industrial development, which was bound to arise, apart from any pre-existing body of a *quasi* similar nature. The written history of the movement can best be read in the successive acts of the legislature which have been passed since the beginning of last century with the view of regulating or repressing trade combinations; and the progress of the development of such combinations, from the position of anti-social conspiracies to a recognized and principal place in industrial life, is of the highest significance. The first concrete instance of a combination of employés answering, though crudely, to the modern union, is in 1387, when the London cordwainers combined against their overseers. Many such combinations on a similar scale followed among other trades, and of them that of the Wisbech shoemakers (1538) is the most important. Coming to more modern times, in 1720 we first find the attention of Parliament directed to the combination effected by the journeyman tailors, and Act 7 of George I. dealt with the matter in a hostile spirit. Later, in 1756, a more sympathetic legislation followed; but it was of short duration, and it was not till 1825 that a measure of recognition was granted. From 1820 to 1842 a strenuous fight was made by trade unionism, with

varying success; and in 1836 the fortunes of the movement were at the lowest ebb, when Chartism, with its propaganda, ousted it temporarily from its place of socialistic importance. After 1843, in spite of repeated drawbacks and discouragements, such as the passing of the Combinations Acts, etc., the progress of trade unionism was, though slow, almost continuous, and in 1870 the famous International Association of Working Men showed eloquently the hold the movement had taken upon industrial life. In 1871 the Trade Union Act was passed, and by its provisions a legal recognition and status was given to trade unionism. The history of the movement, as a specially directed force with a specific purpose, has, roughly speaking, since 1889, become identified with the wider sphere of socialistic propaganda, and the recent increase of labour representation in Parliament is bound further to amend or modify existing legislation between employer and employed. The history of continental trades unionism has always been more or less closely associated with the history of political and social progress, and the movement has been from the outset marked by broader socialistic features. Recently, associations founded on British lines have been formed, and have a firm hold in most of the principal industrial centres. In America, where the labour question is always more acute, but the social and industrial conditions more elastic, than in the older civilizations, trade combinations are recognized by the Labour Department of the state. The earliest union was that of the Knights of Labour, founded in 1869. It was too universal in its scope, however, and its unconstitutional methods weakened its authority. Its place in the industrial world is now filled by such societies as the Amalgamated Society of Engineers and kindred institutions.

The temporary demoralization of trade which follows from the efforts of trade combinations to secure redress of grievances or to advance their interests is the result of those upheavals generally known as strikes. Of these, the most important in this country within recent years have been (1) the London dock strike (1889), which had its origin in the efforts of the dock labourers to secure increase of pay, and resulted in a victory for the men. (2.) The coal miners' strike (1893), which arose from a proposal by the employers to vary the percentage on the men's earnings according to the variation in the price of coal; the workers, on the other hand,



F 4 6 G H 5 B 3 A E 1 D C 2

The Battle of Trafalgar. From the picture by C. Stanfield, R.A.

British fleet - Weather Division - A, Victory; B, Téméraire; C, Neptune; D, Leviathan; E, Conqueror; Lee Division - F, Royal Sovereign; G, Ballise; H, Mars.
French and Spanish combined fleet - Van - I, Buenaure; 2, Santísima Trinidad; 3, Redoubtable; Rear - 4, Santa Ana; 5, Fougueux; 6, Achille.

demanding a fixed 'living wage.' The dispute terminated in the appointment of a conciliation board. (3.) The famous engineering strike and lockout, which began with a demand on the part of the men for an eight hours' day, and extended its scope to include a general revival of the conditions affecting the trade. It ended in a victory for the employers, with, however, beneficial results for the employes.

The general election of 1906, resulting in the return of over fifty Labour members to the House of Commons, nearly three-fifths of whom were trade-union candidates, showed the growing power of these organizations. Since then the members identified with the old trade-union movement have formed themselves into a Trade Union Labour group, independent of the more socialistic section of the Labour party. At the end of 1904 there were 1,148 societies and 1,866,755 members, with funds amounting to over £4 per member. See Howell's *Conflicts of Labour and Capital* (1891); Webb's *History of Trade Unionism* (1896) and *Industrial Democracy* (1897); Nicholson's *Strikes and Social Problems* (1896); Commons's *Trade Unionism and Labour Problems* (1905); and *Trade Unions, Board of Trade Report* [Cd. 2838] (1906).

Trade-winds, so called from their steady course, are met with between the latitudes of 7° to 29° N. and 3° to 20° S. North of the equator this wind blows almost constantly from the north-east, while south of the equator the prevailing direction is south-east. The first attempt to give a correct explanation of their movement was by George Hadley in 'The Theory of the Trade-Winds,' published in the *Philosophical Transactions* for 1735. The principle on which his deductions were founded was that of the unequal velocities with which the diurnal rotation of the earth affected the air particles on the different circles of latitude. From this cause winds flowing from low into high latitudes would become gradually westerly, while winds moving from high latitudes into low would gradually become easterly. This explanation, however, is not quite satisfactory, as Foucault's pendulum experiments in 1850 clearly showed that the deflection depended not on the direction of the motion, but on the latitude and velocity of the wind, and was uniform with winds from all parts of the compass. The distribution of barometric pressure which brings about the permanency of the trade-winds is a belt of comparatively high pressure from 30° 00 to 30° 20 in., which encircles the globe at the

tropics both north and south of the equator, while over the equator and the immediate vicinity to 10° or 15° N. and S. the barometric pressure is from one-tenth to two-tenths of an inch less. In obedience to Buys-Ballot's law permanent winds blow from these respective areas of high pressure towards the low pressure which constitutes the equatorial trough, hence causing the north-east trades of the tropic of Cancer and the south-east trades of the tropic of Capricorn. Above the north-east trades the upper aerial currents are from the south-west, and in the southern hemisphere from the north-west, and are known as the anti-trades.

Traducianism, the doctrine that the souls as well as the bodies of men come into existence by natural generation. See CREATIONISM.

Trafalgar, CAPE, S.W. Spain, at entrance of Strait of Gibraltar, memorable for Nelson's victory over the combined fleets of France and Spain (Oct. 21, 1805).

BATTLE OF TRAFALGAR. The situation on the eve of Trafalgar was as follows. The French and Spanish coasts were blockaded by Cornwallis off Brest, by Calder off Ferrol, by Orde off Cadiz, and by Nelson off Toulon; and there were squadrons of the enemy at each of these places, and others at Rochefort and Lorient waiting for an opportunity to move. Napoleon's idea was for these squadrons to unite, and to hold the Channel; and he hoped to render this possible by diverting the attention of Britain to distant seas. The Rochefort squadron made for the W. Indies, and was chased by Cochrane. Villeneuve, who had escaped Nelson off Toulon, picked up some Spanish ships at Cadiz, and followed. Nelson started in pursuit; but failing to come up with the enemy in the W. Indies, he returned to Gibraltar. Calder met and fought part of Villeneuve's returning force off Ferrol, and Villeneuve took refuge in Cadiz. Nelson, hearing of this, joined Collingwood, who was cruising off Cadiz. On Oct. 19, 1805, the French and Spaniards put to sea again, with thirty-three sail of the line. They at first went south, but on October 21 Villeneuve turned north, in order to get Cadiz under his lee. Nelson therefore attacked. Collingwood, at the head of the lee column, reached the enemy's line first, and made for the *Santa Ana*, the second largest ship present, which occupied nearly the centre of the line. Nelson, in the *Victory*, led the other column for Villeneuve's flagship, the *Bucentaure*, which at the opening of the action was about the twelfth ship from the

head of the line. Every hostile ship within range made a mark of the approaching *Victory*, from which no fire was returned until she closed with the *Bucentaure*. Passing under the stern of that three-decker, she fired the whole of her port broadside through the Frenchman's stern windows, dismounting twenty guns. The *Victory* then passed on to the *Redoutable*, and in conjunction, especially with the *Téméraire*, engaged her until about two o'clock, when she struck. It was during this attack that a musket-ball from one of the tops of the *Redoutable* mortally wounded Nelson. By five o'clock fighting was practically over. The Spanish admiral, Gravina, fled with eleven ships to Cadiz. The French admiral Dumanoir, with four others made off to the south-west, but fell into British hands a few days later. The effects of the victory were to annihilate, for the time, the fleets of France and Spain, to relieve England from serious fear of invasion, and to place the British navy in a position of incontestable superiority for a long term of years.

Tragacanth, or GUM DRAGON, a kind of gum derived from the Asiatic leguminous plant *Astragalus tragacantha* and other species belonging to the same genus. It appears in commerce in the form of small twisted pieces or of flat cakes. It is rarely used in medicine as a demulcent. It is also employed in calico-printing.

Tragedy. See DRAMA.

Tragopan (*Cerionis*), a genus of the pheasant family, whose members are shy, solitary birds, found in hill forests in India and China. The male possesses an erectile fleshy horn above each eye, and a distensible wattle on the throat. The birds are apparently monogamous, but the male goes through an elaborate performance before his mate. There are five species of tragopan, of which *C. satyrus* is the horned pheasant of the Himalayas.

Traill, HENRY DUFF (1842-1900), English man of letters, was born at Blackheath, and received an appointment in the Education Department. He contributed to the *Pall Mall Gazette*, *St. James's Gazette*, *Saturday Review*, and *Daily Telegraph*; also became first editor of *Literature*. He likewise wrote biographies of Coleridge (1884), Sterne (1882), William III. (1888), Shaftesbury (1886), Strafford (1889), Lord Salisbury (1891), Lord Cromer (1896), and Sir John Franklin (1896). He edited a historic work called *Social England* (1893-8), by several writers, and wrote *England, Egypt, and John Franklin* (1896),

and *The Sudan* (1900). Traill was also a humorist of great power, as he showed in *The Israelitish Question* (1876) and in *The New Lucian* (1884).

Trained-bands. See MILITIA.

Train Ferries. See FERRY.

Training. See PHYSICAL TRAINING and GYMNASTICS.

Training Colleges, subsidized institutions, where practical instruction is given, especially in the art of teaching. See EDUCATION.

Training Trees. The objects to be aimed at in the training of fruit trees are the production of a well-balanced tree, and the spacing of the boughs so as to allow sun and air freely to reach all parts. The chief forms of wall trees are the fan and the horizontal espalier. The process of training is rendered much easier if the wall is wired with stout horizontal wires, passing at foot, or better, six-inch intervals, along the entire length of the wall. Fan-training should be begun one year after grafting. The shoot should be cut down nearly to the point of grafting, with a view to producing a vertical central shoot and an equal number of shoots on either side of it, all springing from nearly the same point. By raising the weaker and lowering the stronger, all the shoots should at the end of the season be of about equal strength and size. In forming a horizontal espalier, the strong single shoot of a maiden tree should be cut down to a point just above three buds, about twelve inches from the ground. These three buds are to form a central main shoot and one horizontal shoot on each side. In the following year, the central shoot is again to be cut just above three buds, about twelve inches higher than the previous year's shoots. Each year the process is to be continued until the full complement of laterals is developed. Pyramids, cordons, and bushes are trained on similar lines. Standards and half-standards rarely require much training.

Trains, ARMoured, railway trains of which the engine and carriages or trucks are protected from musketry fire by armour in the shape of high parapets of iron or steel plating. Loopholes in the armour allow the men to use their rifles without unduly exposing themselves. A quick-firing gun on a pivoted mounting is usually carried on one of the trucks. The train consists of an engine and two or three trucks or carriages, the locomotive being in or near the centre. Much precaution, however, is necessary in their use, as they cannot withstand artillery fire, and are, of course, liable to derailling and

wrecking. The value of armoured trains in modern warfare is very problematical.

Trains, HOSPITAL, are used extensively in time of war for carrying the sick and wounded from the field hospitals to the general hospital, and from the general hospital to the base for transport home. Hospital trains must bear the red cross conspicuously displayed, and come under the provisions of the Geneva Convention.

Trajan (52 or 53-117 A.D.), emperor of Rome from 98-117 A.D., was a native of Italica, a town near Hispalis (Seville), in Spain. In 85 he was prætor, in 91 consul, and afterwards governor of Upper Germany. In 97 he was adopted by Nerva. He was consul again in 98 with Nerva, and when the latter died Trajan was elected (98) emperor by the senate. His original name was Marcus Ulpius Trajanus. He was the first Roman emperor not of Italian birth. His reign was largely occupied with military affairs—the first Dacian war, in 101 and 102 A.D., which was ended by the Dacian king, Decebalus, becoming dependent on Rome; the second Dacian war, in 105 and 106, which was ended by the death of Decebalus and the transformation of Dacia into a Roman province. In 113 Trajan engaged in a war with Parthia. In his first campaign he secured Armenia and Mesopotamia; in the second, he took the Parthian capital, Ctesiphon, and descended the Tigris almost to its mouth. But several Mesopotamian cities revolted in his rear. During his absence in the East there were revolts of Jews in Cyprus and Africa, and other revolts in Britain and elsewhere. Trajan died on his way home, at Selinus in Cilicia. He was primarily a soldier, and though he showed respect to the senate he lessened its power. He endeavoured to improve agriculture in Italy, and restored the harbours of Ostia and Centumcellæ; he also provided alimentary institutions for poor Italian children. His government of the provinces was just and careful. Pliny's correspondence with him illustrates his attitude towards Christianity, which, as being opposed to the state religion, he held to be sacrilegious, and therefore punishable, but the Christians were not to be hunted out. His good qualities won him the title of *Optimus* (Best). See De la Berge's *Trajan* (1887).

Tralee, mkt. tn. and seapt., Kerry, Ireland, near head of Tralee Bay, 21 m. N.W. of Killarney. Pop. (1901) 9,867.

Trammel-net. See FISH-ERIES.

Tramontano, the cool northerly wind felt along the shores of the Adriatic, and similar to the bora of Dalmatia.

Tramp. See VAGRANT.

Tramways. James Outram, an engineer and iron master, advising the Duke of Norfolk in 1775, pulled up the wooden rails then in common use at the duke's colliery at Sheffield, and laid down L-shaped cast-iron rails, spiked to cross sleepers. The first Outram plates were laid in 1776, and the line became known as 'Outram's way.' Prior to this, timber and granite slabs had been used at many collieries and quarries, and at the Coalbrookdale works in 1767 cast-iron plates had been used on the longitudinal timber rails primarily. Wrought-iron bars had been tried, spiked to the wooden rails, but they were not stiff enough. Yet no sooner was it found that Outram's way required fewer horses and men, than the drivers got up a riot, tore up the plates, and burned the sleepers. To obviate this, Outram designed cast-iron boxes, one foot square and six inches deep, made hollow; and this was probably the first form of the pan sleeper. Ultimately James Outram's son, Benjamin, substituted for the iron pan sleepers solid blocks of stone. These 'Outram ways' were soon laid down all over the country. In course of time the first two letters of the name were omitted, and the word 'tramway' was evolved.

The tramway proper for passenger traffic on the streets was first adopted in America in 1832, from New York to Harlem. About 1852 a French engineer, Loubat, had wrought-iron rails rolled with grooves for the wheel flanges, and fixed to longitudinal timber sleepers. This system spread rapidly in America. The groove, however, was objected to as being an inconvenience to wheel traffic, and a rail with a step instead of a groove was adopted. These step rails (Fig. 1) are largely used in America at the present time. Tramways were introduced into Britain by George Francis Train, who in 1860 obtained permission to lay a line in Birkenhead with a step rail; but it was found to be a great inconvenience to wheel traffic, and the groove rail was substituted. Liverpool was the first town of any importance in Britain to have an important tramway system, commenced about 1868. It had a flat groove rail fixed to longitudinal timber sleepers, with tie-bars laid on a concrete bed. Fig. 2 shows the Glasgow system of the box pattern of groove rail, and this may be taken as the best type of longitudinal timber

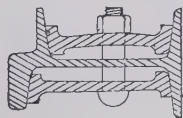


Fig. 1

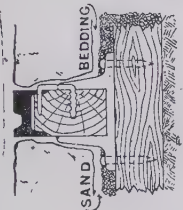


Fig. 2

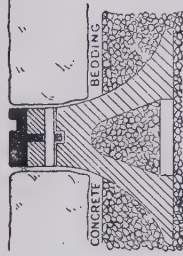


Fig. 3

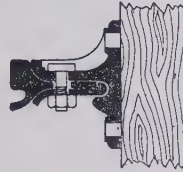


Fig. 4

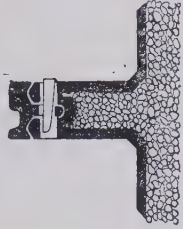


Fig. 5

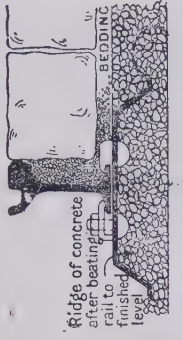


Fig. 6

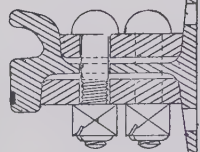


Fig. 7

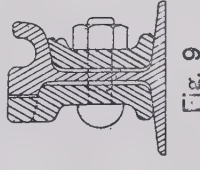


Fig. 8

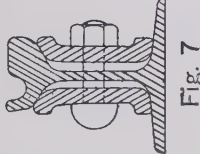


Fig. 9

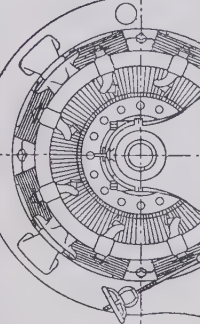


Fig. 10

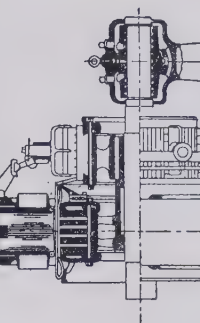


Fig. 11

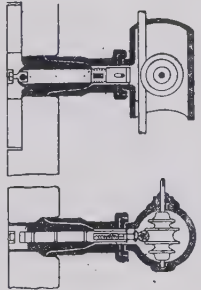


Fig. 12

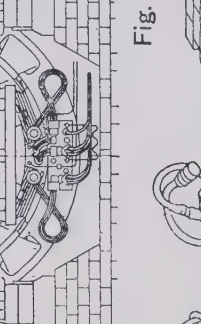


Fig. 13

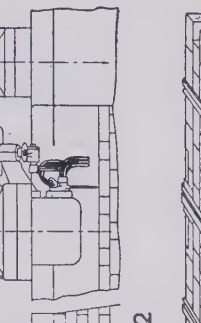


Fig. 14

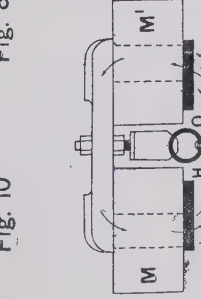


Fig. 15

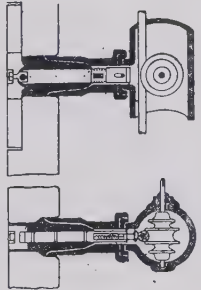


Fig. 16

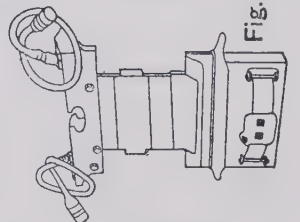


Fig. 17

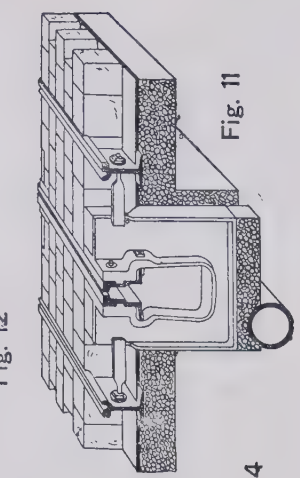


Fig. 18

system. These systems with longitudinal timber sleepers were unsatisfactory, owing to the loosening of the rails on the timber; and to meet this objection numerous built systems were devised with cast-iron chairs or sleepers, and steel rails fixed to these by bolts, cotters, dogs, etc. Figs. 3, 4, and 5 show the most generally used of these built-up types. They were found to be fairly stable under horse traffic with light cars, but failed

Kerr, and used first at Ipswich, as well as at Woolwich, Gateshead, and Wigan. It proved most successful under the heavy traffic, and established the advantage of the girder principle with fish joints. Fig. 6 illustrates this system. After 1880 the grooved girder rail became generally adopted, and may now be considered the universal system. At first the fish beds had too obtuse an angle, and the fish plates themselves were too light in sec-

tion and too short. Figs. 7 and 8 show two of the first sections which were largely used. Figs. 9 and 10 illustrate the sections generally adopted at the present time. Fig. 9 shows a new check fish joint that has been very effective in avoiding the shock at the joints, the outside fish plate being prolonged to the level of the rail head, and carrying the wheels of the car over the rail joint. Both these sections have good fish beds and long, heavy fish plates, secured by six bolts. The girder

rail is now carried on a bed of concrete at least six inches deep, and the paving is kept flush with the rail head and grouted with properly tempered pitch.

Horse traction paid well in most of the large towns in Britain, as will be seen from Table I. It soon became apparent, however, that the effective speed of the cars was too low—i.e. the miles per day per car were too few—and many different kinds of steam locomotives were tried, generally with large bogie cars as trailers. Steam was used principally for connecting groups of small towns, and as a rule the results were not encouraging. In most of these cases the service was too infrequent, with long waits at the termini, so that the miles per car were not more than with horses. Table II. gives the results of four typical schemes.

The results of working cable lines in America induced several companies to try it in Britain, with most successful results—e.g. Birmingham (Central), Edinburgh (Northern), Brixton and Streatham (now electrified), and Douglas (Isle of Man) cable lines. Table III. gives the results of working at Birmingham and Edinburgh (Northern).

Fig. 11 shows the construction of the Edinburgh, Brixton, Douglas, and Matlock cable lines.

Electric propulsion of cars dates as far back as 1835, when Thomas Davenport of Vermont, and in 1838 Robert Davidson of Scotland, both ran experimental cars by voltaic batteries carried on the car. In 1840 Henry Pinks patented in Great Britain a method, taking the current from a conductor laid alongside the rails. It, however, was not until the dynamo electric machine was perfected, so as to reduce the cost of current, that any practical system was devised. George Green applied for a patent as far back as 1879, although it was not granted till 1891 owing to his want of means. Siemens and Halske laid a short line in 1879 at the Berlin exhibition, taking the current by sliding contact from a third rail between the track rails. The Portrush and Giant's Causeway electric tramway, in 1883, was the first line in the United Kingdom which took the current from a conductor.

There was not much done of a practical nature even in America till 1884, when the first electric tramway was made to carry the public at Providence, Rhode Island.

The overhead system had been tried in various towns in America. In Britain, however, there was great difficulty in getting permission to erect overhead wires; but in 1891 the Roundhay line

I.—Horse Traction.—Average of Years 1896, 1897, 1898, and 1899.

Place.	Passengers Carried.	Car Miles per Annum.	Receipts per Car Mile. Pence.	Expenses per Car Mile. Pence.	Miles of Route.
Glasgow.....	102,637,339	8,153,603	11-16	8-46	37½
North Metropolitan, London.....	135,858,697	12,953,998	11-92	10-48	55½
Leicester.....	9,510,767	856,162	11-40	10-00	9
Belfast.....	23,902,064	2,416,224	11-35	7-62	22½

II.—Steam Traction.—Average of Years 1896, 1897, and 1898.

Place.	Passengers Carried.	Car Miles per Annum.	Receipts per Car Mile. Pence.	Expenses per Car Mile. Pence.	Miles of Route.
North Staffordshire, Burnley.....	3,913,746	360,156	14-15	9-31	6½
Gateshead-on-Tyne..	1,895,276	222,466	17-98	13-55	7½
Bury, Rochdale, and Oldham.....	1,776,526	187,965	13-22	9-65	6½
	6,949,678	877,564	11-65	10-47	29½

III.—Cable Traction.—Average of Years 1892, 1893, 1894, and 1895.

Place.	Passengers Carried.	Car Miles per Annum.	Receipts per Car Mile. Pence.	Expenses per Car Mile. Pence.	Miles of Route.
Birmingham (Central)	6,451,518	676,256	12-28	5-94	3
Edinburgh (Northern)	3,345,708	336,066	10-81	6-20	3

IV.—Electric Traction.

Place.	Passengers Carried.	Car Miles per Annum.	Receipts per Car Mile. Pence.	Expenses per Car Mile. Pence.	Miles of Route.
Glasgow, Springburn	14,825,858	927,870	13-87	6-26	5
Leeds.....	29,116,270	2,506,655	12-77	6-49	31½
Aberdeen.....	3,087,117	266,552	10-51	6-03	2½
Dublin.....	41,232,503	5,371,685	8-40	4-82	50

when steam locomotives were used, as the fastenings worked loose at the chairs. About 1860 the first girder rail was invented by Charles Burn, with the groove planed out after rolling. It was, however, too expensive, and was not used to any great extent except in Edinburgh. About 1879 the first girder rail was made with the groove rolled, thus materially reducing the cost. It was a light 58-lb. rail, fixed to a longitudinal wrought-iron trough sleeper. It was patented by John

when steam locomotives were used, as the fastenings worked loose at the chairs. About 1860 the first girder rail was invented by Charles Burn, with the groove planed out after rolling. It was, however, too expensive, and was not used to any great extent except in Edinburgh. About 1879 the first girder rail was made with the groove rolled, thus materially reducing the cost. It was a light 58-lb. rail, fixed to a longitudinal wrought-iron trough sleeper. It was patented by John

was laid in Leeds, and part of the South Staffordshire tramways was converted to the overhead system. Since the opening of the 20th century, this system has been largely adopted. Table IV. gives the expenses and receipts per mile of certain installations. It will be seen that the receipts per mile are reduced by quickening the service, and that the expenses are still higher per car mile than with cable traction. The system, however, is more flexible than the cable, and the first cost is less.

At the present time the general practice in Britain is to distribute the power, and work the cars by continuous current. The pressure used is about 550 volts at the generator terminals, so as to give 500 volts at any part of the trolley wire. In some cases, however, such as Glasgow and Dublin, an alternating current is used for distributing the power at a high voltage, which is transformed and converted to a direct current of 500 volts at sub-stations throughout the system. There are few cases of tramways where the radius of distribution exceeds three miles, and at this distance it is doubtful if the saving of copper in the feeders for alternating distribution is not more than neutralized by the cost of transformers, converters, and sub-stations, with their consequent attendance. But for light railways and underground city railways, with frequent heavy trains, alternating distribution is advisable, whether the current is converted or not.

The underground conduit system has found favour at Bournemouth and in London, the London County Council lines providing the largest conduit tramway system in the world. There are numerous examples to be found also in the leading American and European cities, and the experience gained has been such as to warrant the statement that practically all the working difficulties have been overcome.

Fig. 13 shows a cross section of the centre slot conduit, as used on the London County Council lines. The conductors, as will be seen, are of T-section, and are carried from porcelain insulators bolted to the underside of the slot rails. The current is picked up from the conductors by a plough (Fig. 14), through which it is transmitted to the motors on the car. The plough is made of a kind of rubber called dermatine, with the exception of the part which passes through the slot, which is of steel. Dirt and moisture are prevented from reaching the collecting shoes by the hood projecting over them, as shown in the figure.

The supply of current to electric tramways by means of surface contacts is the method adopted on the Wolverhampton and Lincoln lines, with so far satisfactory results. This system is free from the objection sometimes raised against the overhead—*viz.* unsightly construction—but is more expensive to construct. It is, however, cheaper in first cost than is the conduit system, to which it is similar in that the conductors are laid in conduits.

Fig. 15 shows details of a contact box, as used in the 'Lorain' system as installed at Wolverhampton. It consists of two main parts—(1) the insulating material *ww* of stone; (2) the metallic cover *LOL*¹. When a car is passing over a stud the magnets *MM*¹ on the car magnetize the iron cover *LOL*¹, the magnetic lines passing the intervening space to the armature *A*, which is raised from *A*¹ to *AA*, thus bringing together the carbon contacts *D* and *E*, and delivering current to the car motors through the centre *O* and the collecting shoe *H*. Fig. 16 shows a contact and switch plate, as used at Lincoln, where the Griffiths-Bedell system is employed.

The contact plates are extremely simple, consisting of T-shaped pieces of cast iron, bedded with bitumen into a setting of solid granite. The stem of the contact projects downward into the outlet of the conduit. The lower end of the stem is slotted out, and in the fork so formed a simple sliding switch piece of iron, the only moving part, is supported on a spring of phosphor-bronze wire, and slides between copper faces in the fork. At the lower end of the switch piece a carbon contact is secured by copper clips, electrical connection with the stem being made by flexible copper leads.

The mode of operation is as follows:—When the magnet carried by a car passes over the contact plate, the stem of the contact is magnetized, and the sliding piece moves downward, partly through attraction, towards the cable beneath, and partly repelled by mutual magnetic action between itself and the iron of the fork. Thus the carbon block comes in contact with the cable, and the current passes to the head of the contact plate, where it is received by the collecting skate on the car. Directly the car has passed, and the contact plate ceases to be magnetic, the pull of the spring withdraws the carbon block from the cable, and the plate is left absolutely dead.

Nine or ten years ago it was the common practice to speed up the small electric generators by

belts from the engines, in some cases from a counter shaft. This, however, has now been abandoned, and all generator armatures are keyed to the crank shaft of the engine, or in other words are driven direct. There are still, however, differences of opinion as to low or high speed engines and generators. The high speed units are cheaper, and the modern high-speed engine (400 revolutions) is not far behind the slow speed (90 to 100 revolutions) in the matter of efficiency. Most engines are now of the compound, condensing type, vertical or horizontal. Fig. 12 shows the most recent construction of a traction generator. Motors are generally now of the single reduction, four-pole, enclosed type, operated by the series parallel controller.

More recently, however, the steam turbine has come into favour, this form of prime mover being employed in the power stations of the Metropolitan District and Metropolitan Railway Companies.

An interesting arbitration has been held between the Metropolitan and the District railways of London. The question was as to the method of electric traction to be used for working their underground and suburban lines. The Metropolitan Railway Co. had decided to adopt a system matured by Messrs. Ganz of Budapest, and the District Co. were in favour of three-phase distribution at high pressure to sub-stations, when the current would be converted to 500-volt direct current to charge the third rail conductors. This is a safe current, and well within the Board of Trade allowance. The Ganz system provides that a three-phase alternating current of 3,000 volts shall be carried by overhead wires throughout the line, and used to operate the cars without conversion, the cars to be equipped with large induction motors. These are controlled by water rheostats. Both motors are in use till full speed is arrived at, when one motor does all the work. In pulling up, both motors come into use as brakes till half speed is reached, when the train is brought to a stop by the mechanical brakes. It is said that the efficiency is low compared with direct-current series-wound motors, excepting at half and full speed, with considerable loss in acceleration in starting. These points, and the fact that it is practically untried, seem to have put it out as a system for the London underground railways. The arbitrator, Hon. Alfred Lyttelton, gave his award in favour of the District Railway Co.'s system. See ELECTRIC TRACTION.

LAW RELATING TO TRAMWAYS.—Tramways are governed by the Tramways Act, 1870, which does not apply to Ireland. Provisional orders for building tramways may be obtained from the Board of Trade by the local authority, or by a company with the consent of the local authority. A company must deposit 4 per cent. on the estimated cost, furnish plans, etc., and must not take land except by agreement. The provisional order may then be confirmed by Act of Parliament; but if petitioned against, it must be referred to a select committee. Owners of adjoining property may insist on a distance of 9 feet 6 inches between the tram-line and the footpath. The line must be completed within two years of the order, and may be leased for not more than 21 years by a local authority to a company. In the absence of provision to the contrary, the gauge must be 4 feet 8½ inches; and a tramway which is not properly worked by the promoters, or not worked at all, may be put into other hands, under a Board of Trade licence, for not more than three years, or removed if unused for three months. The local authority may buy a private tramway after twenty-one years, or after the expiration of seven years from such period, on paying the cost of construction of the tramways, less depreciation. Military tramways are governed by the Military Tramways Act, 1887. See RAILWAYS.

Trance is a sleep-like state from which the patient cannot be roused, and which arises spontaneously without gross brain lesion such as cerebral hemorrhage, or toxic cause such as opium poisoning. The subjects of trance are seldom in good health, and are often hysterical. The condition occurs most frequently in females between the ages of twelve and thirty. In rare instances trance has been produced voluntarily, and minor degrees may be induced by hypnotism. Usually consciousness is in abeyance, and the patient preserves no recollection of what has passed during the trance; but in some cases consciousness and memory remain active, volition only being abolished. In trance which is so deep as to simulate death, vitality may be proved by the absence of decomposition, by the excitability of the muscles to electrical stimulation, and by the ophthalmoscopic appearances of the fundus oculi. Treatment must be adopted to rouse the patient and to maintain the function of nutrition. Strong faradization of the muscles is of service, and concentrated foods and stimu-

lants should be introduced by the nasal tube or by the rectum. Warmth should be promoted by hot-water bottles and friction, and in continued trances the formation of bed sores must be prevented.

Tranent, police bur., Had-dingtonshire, Scotland, 9½ m. E. of Edinburgh; has collieries and quarries. Colonel Gardiner, who was killed in the battle of Prestonpans, was buried here. Pop. (1901) 2,584.

Trani (anc. *Turenum*), seapt. tn., Bari prov., S. Italy, on the Adriatic, 28 m. by rail N.W. of Bari; has trade in wine and olive oil, but its harbour is now silted up. Its 12th-century cathedral has a Norman tower. Pop. (1901) 32,059.

Tranquebar, seapt. tn., Tanjore dist., on Coromandel coast, Madras Presidency, India, 22 m. N. of Negapatam; was a Danish settlement from 1624 to 1807, and was purchased by the British in 1845. It was the first Protestant missionary settlement in India (1703). It has a curious old fort (i.e. the Castle of Danneborg). Pop. (1901) 6,000.

Trans-Alai, mt. range of Russian Central Asia, Fergana prov., forming an extreme S.W. outlier of the Tian-Shan system, separating the Pamir proper from the Alai valley. It has a mean height of nearly 15,000 ft., and in its highest summit (Peak Kaufmann) attains 24,800 ft.

Transbaikalia, or DAURIA, prov., E. Siberia, extending from Lake Baikal nearly to the Great Khingan Mts., and from the Chinese frontier to the province of Irkutsk. The country is a plateau, lying about 2,000 ft. on an average above sea-level, with mountains rising to a moderate height above this level—e.g. the Khamar-Daban, the Barguzin, and the Yablonovoi. The country is watered in the S. by the Shilka and Argun, and other tributaries of the Amur, and by the Selenga and its tributaries flowing into Lake Baikal. In the N. the Barguzin and Upper Angara enter the lake, while the Vitim flows to the Lena. The climate of Transbaikalia is severe, especially in the N. and E. of the Yablonovoi range. The precipitation is small, not exceeding 15 in. Cattle-grazing is an important industry; and fish are caught in the rivers and small lakes, as well as in Lake Baikal. Forests cover 25 per cent. of the area. Silver and gold are worked at Nerchinsk, and iron at Petrovsk. Gold is obtained in the Vitim basin. Seventy per cent. of the population are Russians; the Buriats are beginning to abandon their nomad life; the Tunguses have for the most part

mingled with the Russians or Buriats, and only a few Orochons continue to lead the wandering life of hunters. Khita is the capital. Area, 229,520 sq. m. Pop. (1897) 676,407.

Transcaspian Railway, a railway built by the Russian government from Krasnovodsk (40° N. lat.), on the E. side of the Caspian Sea, along the S. side of the Kara-kum desert to the oasis of Merv, a distance of 870 m., whence it branches N.E. to Bokhara, Samarkand, and Andijan in Fergana, and S. to Kushk on the frontier of Afghanistan. The line was opened as far as Merv in 1886. Between Samarkand and Andijan a short branch runs N. to Tashkend, where it meets the Orenburg-Tashkend Ry., opened in 1905-6.

Transcaspian Territory, a prov. of Russian Central Asia, now forming part of the general government of Turkestan; lies between the Caspian Sea, Persia, Afghanistan, Bokhara, and Khiva. Area, 213,855 sq. m.; pop. (1897) 377,416. The surface is naturally divided into four parts—(1) the mountainous region on the S. (Kopet Dag, Badkhis); (2) the arable and pasture land at the foot of the mountain region; (3) the lowland of the Kara-kum desert; (4) the Ust-Urt plateau, with the Mangyshlak peninsula. The chief rivers are the Heri-rud (or Tejen) and the Murghab. The principal mineral deposits are salt, gypsum, sulphur, and petroleum. In 1901 the population was composed of Turcomans, 75·7 per cent.; Kirghiz, 17 per cent.; Russians, 2·9 per cent.; with Armenians, Persians, Tartars. Chief town, Ashkabad. The Merv oasis in this region was the seat of a very ancient civilization, visited and developed by Alexander the Great, fostered by his successors in empire, devastated by the Mongols, and in recent centuries a prey to anarchy till the Russian conquest (1869-85).

Transcaucasia, that part of the Russian empire which lies S. of the main chain of the Caucasus range. It is 94,182 sq. m. in extent, and has a population (1897) of 5,516,139, including the province of Daghestan to the N. of the range. The river Aras, a tributary of the Kura, forms part of the S.E. boundary. A depression extends right through the country from N.W. to S.E., formed on the W. by the Rion valley (the ancient Colchis), and on the E. by the Kura valley, which broadens out towards the S.E. into wide steppes. Between the Rion and Kura valleys runs the Suram ridge, which connects the Caucasus with the Little Caucasus and the Armenian High-

lands on the sea. The Rion-Kura valleys enable a railway to run from Poti and Batum, on the Black Sea, *via* Tiflis, to Baku. The rainfall decreases from w. (80 in. per annum) to E., where the Kura steppes receive under 10 in. In the w. orchards, vineyards, cornfields, and pasture occur in rich alternation, while a belt along the Black Sea from Sukhum to the Turkish frontier grows good tea. Pine timber flourishes at a mean elevation of 7,730 ft.; the mulberry and vine at between 3,000 and 3,400 ft. Excellent horses and a fine strain of cattle are bred. Transcaucasia rivals the Pennsylvania fields in its output of raw naphtha, the richest field lying round Baku, on the Apsheron peninsula, and another round Tiflis. Within the limits of the country some seventy different tongues are spoken, and perhaps 150 different peoples inhabit its valleys, the chief of whom are the Mingrelians and Imerians in the w., the Ossetes and Georgians in the centre, the Aderbaijan Tartars in the s.e. steppes, and Armenians and Kurds in the mountainous s. The chief town is Tiflis.

Transcendent, Transcendental, Transcendentalism. Transcendent is opposed—(1) to immanent (see IMMANENCE); (2) as a technical term of Kantian philosophy it is applied to doctrines which profess to give us knowledge of things quite beyond the boundaries of experience—*e.g.* the doctrines of the old natural theology; while transcendental refers to the *a priori* principles—*e.g.* causality—that are involved in the constitution of experience itself. But Kant's usage of the terms is by no means consistent. The terms transcendental and transcendentalism are now applied in a wide sense to any philosophy of a Kantian type, such as T. H. Green's. In American literature, transcendentalism is a name for the type of thinking represented by Emerson.

Transept, in architecture, the transverse arm of a cruciform church. See ARCHITECTURE.

Transfiguration, FEAST OF, an ecclesiastical festival, kept on August 6, and called in the Greek Church the Feast of Tabor. It was known anciently in England as 'the overforming of our Lord on the Mount Tabor.' Pope Calixtus III. enjoined the above date in 1457.

Transformer, a device for effecting the transformation of electrical energy from one form to another, as of high-pressure continuous or alternating current into low-pressure current, of alternating into continuous current or

vice versa, of two-phase into three-phase current, and so on. In a narrower sense, the term is restricted to those transforming devices which contain no rotating parts, sometimes referred to as static transformers. The term converter, which was at one time used as a synonym for trans-

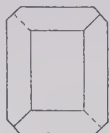


FIG. 1.

former, is now generally restricted to transforming devices which contain a rotating part; these were formerly termed rotary transformers. Again, the term continuous-current transformer, or dynamotor, is used when the transformation refers to continuous currents. This kind of transformer is really a combination of a continuous-current dynamo with a continuous-current motor. The two machines are mechanically coupled, one of them being supplied with high-pressure electrical energy, and the other giving out low-pressure energy, or *vice versa*. In some cases, the two machines have been combined into a single one, by having the high and low pressure armature windings arranged on the same armature core.

A transformer proper, or static transformer, consists essentially of two coils wound on a common laminated iron core. One of these coils, termed the primary, is supplied with an alternating current, which gives rise to an alternating magnetization or 'magnetic flux' in the iron core. Since the second coil, or secondary, is wound on the same core, it is subject to the inductive action of the alternating flux in the core,

links of the chain, and consist of electric circuits, while the intermediate link is magnetic, and is represented by the core, which is frequently spoken of as the magnetic circuit of the transformer. All modern transformers are provided with a closed magnetic circuit—*i.e.* the iron forms a closed path or circuit, so that the magnetic lines are practically confined to the iron.

The core of the transformer is built up of a series of thin sheet-iron stampings, the thickness varying according to the frequency of the current, from about 0.014 inch up to 0.02 inch. This subdivision or lamination of the core is necessary in order to prevent as far as possible the circulation of 'eddy' currents in the core itself; such currents merely heat the core, causing a waste of power.

For the sake of simplicity of construction, the core stampings are generally rectangular; and hence, in order to provide a closed magnetic circuit, joints become necessary. The better the joint, the less will be the amount of current necessary to produce a given number of magnetic lines. Fig. 1 shows the core of a Crompton transformer. Fig. 2 shows the coil in position, P and S standing for the primary and secondary respectively.

If the primary is supplied at a constant electrical pressure, the pressure across the secondary terminals will also remain approximately constant. Again, the primary current increases very nearly in proportion to the secondary current; and when the secondary is open, very little current flows round the primary.

In order to improve the regulation of the transformer, it is desirable to have the two coils in as close association with each other as possible, so that any magnetic flux produced by the primary is bound to pass through the secondary. For this reason it is usual to divide each coil into a number of sections, and to alternate the sections of the one coil with those of the other.

The efficiency of transformers at full load exceeds 95 per cent. in the case of small transformers, and approaches 98 per cent. in large ones.

The ratio of the number of turns in the primary to that in the secondary is very nearly the same as that of the primary and secondary pressures, and is called the ratio of transformation. If the transformer is used for passing from a high to a low pressure, it is called a step-down transformer; if from a low to a high pressure, a step-up transformer. Ordinary transformers are enclosed in cast-iron waterproof

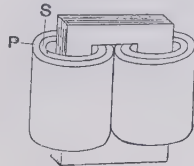


FIG. 2.

and becomes the seat of an alternating electro-motive force, which will produce an alternating current if the secondary circuit be closed. An ordinary induction coil is a species of transformer.

A transformer may thus be regarded as forming an electro-magnetic chain of three links; two of these—the primary and the secondary—are the extreme

cases, and are provided with fuses in both circuits.

Thus, for use with Ferranti rectifiers, a constant-potential to constant-current transformer is used. In this, the secondary is fixed, while the two sections of the primary are movable. When a current passes through the secondary, repulsion between the primary and secondary coils takes

place at constant pressure, the secondary delivers an approximately constant alternating current.

In the case of exceptionally large transformers, the radiating surface is relatively small, and it becomes necessary to provide special cooling devices, either by immersing the transformer in a tank through which oil is kept

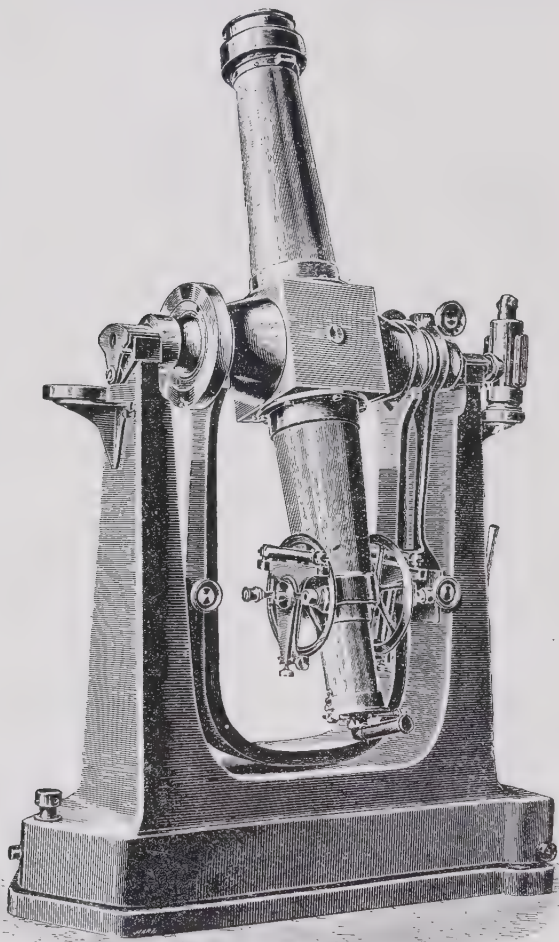
transformer whose ratio of transformation is unity. Yet such transformers have been used in the United States, in connection with a special system of lighting by alternating arcs. The only function which such a transformer performs is that of insulating (and thus rendering safe) the circuit of the lamp from the high-pressure circuit to which the primary of the transformer is connected. The primaries are all joined in series, and this is the only instance within recent times in which a series connection of transformers has been used. In all other cases the connection of the primaries to the alternators is a parallel connection.

For two and three phase transformers, as well as for rotary converters, see DYNAMO. Further information will be found in Kapp's *Transformers* (1885), and in Fleming's *Alternate Current Transformer* (1903).

Transformismo, a political system of Italy, first introduced (1884) when Depretis was prime minister (1881-7). The members of the ministry do not necessarily belong to one political party, but are selected from all parties, on account of their individual influence and the votes that they can command in the chamber. There is therefore no joint ministerial responsibility, but each minister is directly responsible to Parliament for his own measures, so that the fall of one does not involve that of the rest. The consequence is an entire relaxation of party discipline, without any corresponding diminution in the bitterness of party rancour. Crispien endeavoured to minimize the confusion by taking as many offices as he could into his own hands, and thus giving some unanimity to the administration. The ultimate result has been to discredit the whole system of parliamentary government in the eyes of the Italians. See Stillman's *The Union of Italy* (Cambridge University Press, 1898).

Transfusion, an operation the object of which is to add fluid to the circulation, generally through a vein in the arm. In the great majority of cases saline solution is the most suitable fluid—i.e. $\frac{1}{2}$ per cent. of common salt dissolved in distilled water—but plain, aseptic water and blood are occasionally used.

Transit Instrument, an astronomical apparatus invented by Olaus Roemer in 1689, for ascertaining the time of star transits across the meridian. It consists of a telescope mounted on a rigid horizontal axis perpendicular to the tube, fixed in an east and west direction, and turning on pivots set in bearings shaped like the letter Y. If the



Modern Transit Instrument.

place; and the farther they move away from each other, the less is the proportion of the magnetic flux due to the primary which passes through the secondary. Any tendency on the part of the secondary current to increase is checked by the increased displacement of, and reduced electromotive force in, the secondary. Thus, when the primary is sup-

plying at constant pressure, the secondary delivers an approximately constant alternating current.

Transformers are used in connection with every system of alternating current distribution for effecting the changes of pressure which are necessary for economical working. At first sight there would appear to be no object in using a

adjustments are correct, the telescope then revolves in the plane of the meridian. A small graduated circle attached to it facilitates settings in declination; and a reticle, composed of five or more vertical and a few horizontal spider-lines (called 'wires'), is placed at the focal plane of the object-glass near the eye end. The bisection of a star by the central wire marks, with the aid of a clock, the instant of its transit; but additional accuracy is secured by taking the mean of corresponding observations at all the wires of the reticle. The provision of a reversing apparatus enables the instrument to be turned through 180°, whereby, the pivots being inverted, the precise horizontality of the axis can be tested. A 'broken transit' has a reflector, usually a right-angled prism, set at the junction of the tube of the telescope with the axis. The rays from the object in view are thus reflected along the hollow axis in a horizontal direction to an eye-piece fixed at one of its extremities. The observer, by this arrangement, maintains the same position whatever the altitude of the star in the field. Errors due to flexure are, however, apt to arise. A 'universal transit instrument,' adapted for observing transits over any vertical circle, was constructed on the broken-tube principle by Bamberg for the Berlin observatory about 1875.

The transit circle, an appliance of primary importance to exact astronomy, is of more massive build than the simple transit instrument. By means of a large, carefully graduated circle attached to the axis declinations can be measured simultaneously with right ascensions, and hence a complete observation with it fixes the place of a heavenly body in both co-ordinates. For this purpose the star, or other object, is made to run, by turning a slow-motion tangent-screw, along a horizontal wire, until it meets the central vertical wire of the reticle, when the moment of transit is recorded with a chronograph, and the declination circle read with powerful microscopes to tenths of a second of arc. The observation of transits with a moving wire is also feasible. By means of a travelling eye-piece the star is kept apparently at rest, while the motion of the bisecting wire is automatically recorded on the chronograph by suitably arranged electric contacts. This method has been practically realized at the Cape observatory, with the view of eliminating personal equation. The first British transit circle was erected at Greenwich in 1850, and is still in use. It has a

diameter of six feet, and carries a telescope of eight inches aperture and twelve feet focal length. A facsimile of it, mounted at the Cape in 1855, was replaced in 1903 by a reversible instrument embodying the newest improvements.

Transition, in architecture, refers to the period of change from one style to another. It is variously used, but generally refers to the change from Norman to the Pointed style. Sharpe uses it in this way to designate one of his seven periods of English Gothic.

Transkei Territory, part of Cape Colony, between the Great Kei R. and Natal Area, 2,552 sq. m. Pop. (1904) 177,647, including 1,704 Europeans.

Transmigration. The doctrine of metempsychosis, or the transmigration of the human soul after death into a living human body as yet unendowed with a soul, or otherwise into the body of one of the lower animals, is popularly associated with the Greek philosopher Pythagoras. The immortality of the human soul was one of the tenets of the Druids of Gaul and Britain in the days of Julius Cæsar. But the belief in metempsychosis is obviously of much older date than the times of the Druids and of Pythagoras. It is an ancient Oriental belief, as every reader of the *Arabian Nights* realizes. Moreover, it is found among races having no near contact with Europe and Asia, such as the Zulus and Moquis of N. America, and the S. American Chiriguano and Piro. The negroes of the Ivory Coast of W. Africa reverence the huge bats which haunt the Tanoe R., believing them to be the souls of the dead. The tribes of the upper Zambezi not only believe that after death their souls pass into an animal, but they also imagine that during life they can successfully decide, by means of certain rites, the kind of animal that will be allotted to them. The Chams of Indo-China hold a similar belief. The Igorrots of the Philippines imagine that river eels are animated by the souls of their ancestors. A different form of metempsychosis obtains among the Battas of Sumatra, who believe that by witchcraft the soul of a living man can be transferred into an animal. Of another order is the belief in the transmigration of a divine soul into man, for which see the article INCARNATION.

Transmission of Power. See ELECTRIC POWER TRANSMISSION; GEARING; BELT AND ROPE GEARING; and MOTOR CARS AND CYCLES.

Transpadane Republic. See CISALPINE REPUBLIC.

Transpiration. See PLANTS, PHYSIOLOGY OF.

Transplanting. In moving large trees, say those from ten to twelve inches in diameter and from twenty-five to thirty feet high, it is well to prepare them in June by trimming and cutting or sawing off the roots at a distance from the trunks of from six to eight feet. After the roots have been laid bare and the soil has been knocked away from them, the transporting machine, which bolts together, is placed around it and bolted together again. At each end of the frame of the machine is placed a windlass or winch, by which trees can be lifted and lowered, large double ropes passing over rollers to the windlasses. When the tree has arrived at its new place, timbers are placed across the hole so that the hind wheels can be backed over it. The tree is then lowered to the proper depth, and good, mellow soil is thrown in and packed well into all the cavities under the roots. When the hole is half filled, several barrels of water should be poured in; and when the water has disappeared, fill in and pack the soil till the hole is a little more than full.

Transport, MILITARY, the means by which the baggage, supplies, stores, hospitals, and generally all the *impedimenta* of an army, are carried. Railways, ships, and boats may play a considerable part; but even then a large portion of the transport must be carried out by the use of wheeled vehicles, pack animals, or even carriers. Transport in the field may be divided into (1) regimental transport, (2) special or departmental transport, and (3) general transport. Under the term 'special or departmental transport' we may include that of the ammunition columns, which is under the orders of the artillery authorities, and is manned entirely by the artillery; the technical transport of the engineers, controlled and manned by that corps; the transport allotted to field hospitals and bearer companies, under the orders of medical officers, but furnished with drivers and vehicles by the train (or, in the British army, by the Army Service Corps); that furnished by the same corps and distributed to brigades, divisions, and army-corps staffs to carry baggage and *impedimenta*—in short, all that transport which is required to supplement the regimental transport. The general transport works from the base along the lines of communication and from the advanced depôts of these lines up to the army itself. This portion of the transport, stretching far behind the army, is under the command and man-

agement of a field officer, termed the 'director of transport,' who serves under the orders of the 'general of communications.'

In the British service the military train is represented by the transport companies of the Army Service Corps, while the executive duties of supply fall to the supply companies of the same corps. But in time of war, in addition to the organized military transport, there must always be a large quantity of civil labour employed, together with the means of conveyance procurable in and suitable to the theatre of operations. Often, also, it may be necessary to hire men and to purchase animals for transport purposes in other countries and convey them to the seat of war. This civil element should

17th century the practice arose of reprieving felons on their petition that they should be transported. But this could not be done against their consent till the passing of the Transportation Act of 1824, which enabled the king in council to appoint places of confinement beyond the seas, and an act of 1827 imposed the penalty of transportation for felony in all cases where no other punishment was provided. The colonies protested so strongly that the sentence of transportation was abolished in favour of penal servitude (Penal Servitude Act, 1853). See PRISONS.

Transporter Bridge, a type of bridge invented by Charles Smith in 1872, though the first to be actually constructed was that

but to transpose and play music for the piano at sight requires considerable musical ability and practice.

Transubstantiation, a theological term expressive of the nature and extent of the change which is wrought in the consecrated elements in the celebration of the holy communion. The term transubstantiation is first found in Peter Damian's treatise on the canon of the mass (11th century). It was first recognized by the church in the constitution presented by the church in the constitution presented by Pope Innocent III. to the fourth Lateran Council (1215). The Council of Trent (1551) formally reaffirmed the dogma, and it was inserted as an article of faith in the creed of Pope Pius IV. In the Eastern



Transporter Bridge over the Mersey at Runcorn.

be entirely employed as general transport, under the director of transport, on the lines of communication, where it will be less exposed to attack from the enemy.

Transport and Remounts, DIRECTOR OF, a new post created at the War Office on the recommendation of Lord Esher's committee. The duties consist of the control and administration of all questions affecting transport for the army in times of peace and war, together with full control of the purchase and maintenance of remounts. The director is attached to the department of the quartermaster-general.

Transportation, as a punishment and as distinguished from banishment, was first inflicted on the moss-troopers of Northumberland by an act of 1666. In the

over the river Nervion, 9 m. N.W. of Bilbao in Spain in 1893. This was followed by others at Rouen, Bizerta (since removed to Brest), Rochefort, and Nantes in France, and one across the Usk at Newport and another across the Mersey between Widnes and Runcorn. The transporter bridge is like an ordinary suspension bridge, but is placed sufficiently high to allow of the tallest masted ships passing freely underneath it. The girders form a horizontal railway, and on this runs a trolley, which supports a transporter car. This travelling at a low level carries across passengers and traffic.

Transposing is the term applied to the performance of music in another key than that in which it is written. The change of key may scarcely affect a vocalist,

Church this dogma is expressed under the term *μετεσώσις*, as adopted by the Orthodox Confession of Faith of the Catholic and Apostolic Church of the East (1643). The doctrine of transubstantiation may be stated to be that, while the accidents of the bread and wine (as the colour, smell, taste, etc.) continue, the whole substance of the bread is transmuted into the actual substance of Christ's body, and the whole substance of the wine into the actual substance of His blood. This dogma was repudiated by the Anglican Church in the 28th Article. Its own doctrine on this subject may perhaps be gathered from Hooker (*Eccles. Pol.* bk. v. lxvii. 11): 'Christ doth by His own divine power add to the natural substance. . . supernatural effi-

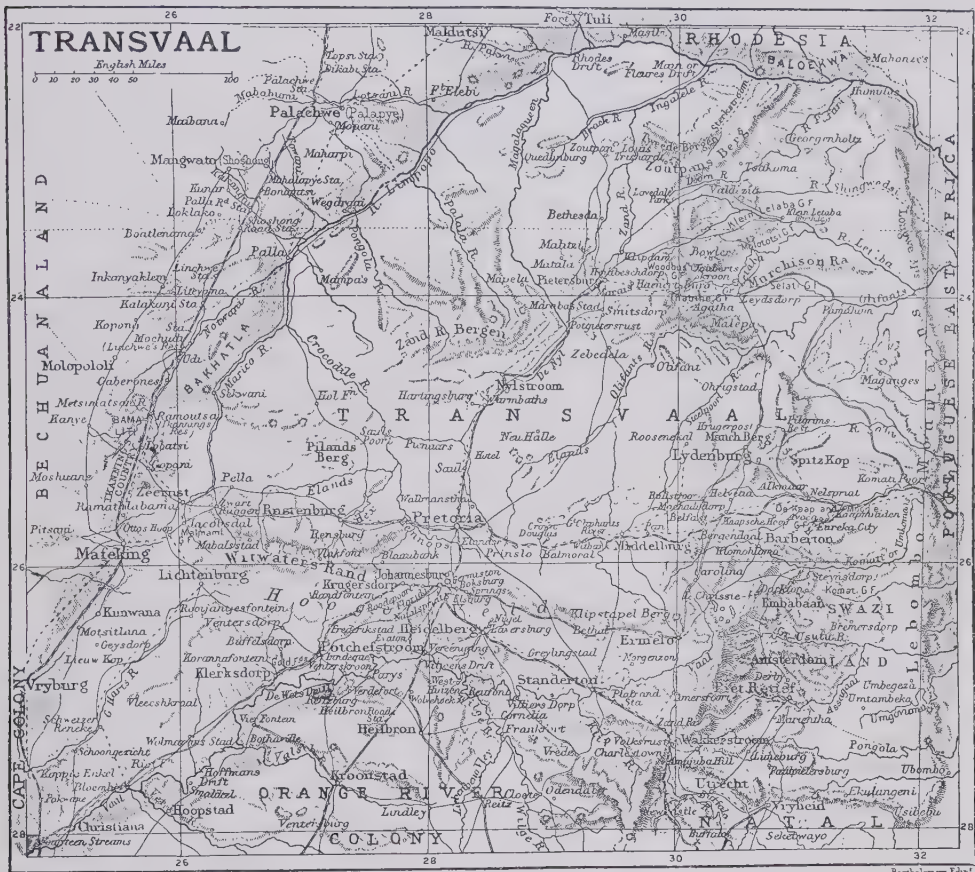
cacy, which additions to the nature of the consecrated elements maketh them that unto us which otherwise they could not be.' (Cf. Bishop Harold Browne *On the Thirty-nine Articles*, ed. 1887.)

Transvaal Colony, formerly the South African Republic, S. Africa, between lat. 28° 40' and 22° s. and long. 24° 40' and 32° E. On the s. lie Natal and the Orange River Colony; on the E. Swaziland and Portuguese E. Africa; on the N. Rhodesia; on the W. British Bechuanaland and the

Chinese coolies were introduced for mining purposes in 1904, and there are now about 50,000 Chinese so engaged in the Transvaal. The Witwatersrand, or White Water ridge, on which the gold of the Transvaal is chiefly found, extends from E. to W. Such rivers as the Klip, Riet, Elands Spruit, and the Mooi flow S. from this ridge. West and E. of Pretoria stretch the Cashan or Magaliesbergen. On the E. lie the Kaap Mts., with deep gorges and picturesque scenery, and

of Pretoria; coal is mined in the Barberton, Middelburg, and Pietersburg districts; diamonds are obtained near Pretoria. In 1905 the output of the Transvaal mines was valued at £22,688,675, of which £922,780 were of diamonds. The capital is Pretoria, but the largest town is Johannesburg, the Rand mining centre.

The Dutch Boers are Protestants, and belong in great part to the Dutch Reformed Church. The British belong to the Anglican Church, the Wesleyan, the



Bechuanaland Protectorate. In January 1903 the s.e. districts of Vryheid, Utrecht, and a portion of Wakkerstroom were added to Natal. Area, 111,196 sq. m.; pop. (1904) 1,268,716, of whom 969,389 were natives and 299,327 whites. The mining centre of the Rand is the most densely populated region. The British and Europeans live chiefly on the gold mines and in Johannesburg, the Boers in the country.

with gold-mining industry. The Hooie Veld, or high summer pasturage, is another feature of the Transvaal. The air is keen and bracing on the uplands, but the low-lying districts are hot and occasionally malarious. In certain localities the soil is rich and deep, and the 'mealies' thrive for feeding the natives. The production of wine is a growing industry. Water is plentiful. Iron is found in the vicinity

Presbyterian, and others. The teaching in the schools is conducted in English, unless the parents desire their children to learn Dutch. There are a Normal College at Pretoria and the Technical Institute at Johannesburg. English is the official language. Imports (1904-5), £13,627,377 (£6,398,437 from Great Britain); exports, £17,770,988, chiefly gold.

In 1833-7 the Boers, under Potgieter and others, moved,

chiefly from Graaf Reinet district in Cape Colony, to the veld N. of the Orange R. In 1849 Lydenburg was made the capital of the Dutch African Republic. Six years later the name was changed to the South African Republic. In 1877, in consequence of serious difficulties with the natives and of financial troubles, the Transvaal was annexed by the British government. In 1880 the Boers took up arms to reassert their independence, and after the British disasters at Bronker's Spruit, Laing's Nek, Ingogo, and Majuba, the first convention was signed (1881), giving the Boers complete self-government under the suzerainty of Great Britain. A second convention in 1884 restricted British control to external affairs, except with the Orange Free State; and the name of the South African Republic was given to the Transvaal. The discovery of gold in the Witwatersrand in 1885-6, and the consequent inrush of 'Uitlanders' or non-Boers, the unfair treatment of the 'Uitlanders,' the armed invasion of the state by Dr. Jameson (the Jameson Raid) in December 1895, and the Boer dread of interference with their rule, brought about a state of matters which culminated in 1899 in a declaration of war (October 11) by the South African Republic and the Orange Free State. Both were annexed by Great Britain, the former on Sept. 1, 1900. Peace conditions were signed at Vereeniging on May 31, 1902. Since then the country has been governed as a crown colony under a governor and a lieutenant-governor, assisted by an executive and a legislative council. In April 1905 a new constitution was granted, establishing a legislative assembly of from 6 to 9 official and from 30 to 35 elected members; but before this measure came into force it was revoked, and a promise of self-government made to the colony. For local administration there are elective municipalities in the larger towns. The South African constabulary, 5,000 strong, forms the police force, and the military forces number over 14,000 men. See SOUTH AFRICAN WAR; also L. Phillips's *Transvaal Problems* (1905).

Transylvania. See HUNGARY.
Trap, a geological term for any dark-coloured basic igneous rock, such as basalt, dolerite, and diabase. Traps very frequently occur as lava flows and intrusive sheets (Sweden, India, Iceland, Faroe, Skye), and then weather with terraced features. Though still used, especially by popular writers, as a general name for basic rocks which are fine-grained to medium-grained,

the term has no very precise definition. Trap dykes are dykes filled with some dark kind of basalt or lamprophyre. Recently an attempt has been made to revive the use of the term and give it a more scientific connotation.

Trapa, or **WATER CALTROPS,** a genus of mostly tropical aquatic herbaceous plants belonging to the order Onagraceae. They bear solitary flowers, followed by one-celled bony beaked fruits. The submerged leaves are pinnate-partite, with filiform segments, the floating leaves being rhomboidal. *T. natans* is the Jesuits' nut or water chestnut; whilst *T. bispinosa* yields Singhara nuts, a common article of food in the East. The curiously shaped seeds of this plant, which may be compared to the heads and horns of a cow, are familiar objects in Chinese bazaars as 'horn chestnuts.'

Trap and Ball, or **KNUR AND SPELL,** an old English game, played by two or more persons with a ball, bat, and trap, the last a piece of wood somewhat like a shoe, hollowed at the heel and moving on a pivot, into which the ball is placed.

Trapani (anc. *Drepanum*), seapt. tn., Sicily, Italy, on W. coast, 47 m. W.S.W. of Palermo, cap. of prov. of same name; has manufactures of coral, alabaster, and mother-of-pearl goods. Grain, olive oil, salt, salted fish, wine, cheese, alimentary paste, and building stone are exported. Wheat, wood, and coal are the principal imports. Exports (1905), £145,138; imports, £282,456. Trapani was a Carthaginian stronghold, and became a Roman colony in 241 B.C. Pop. (1901) 61,448.

Trapezium, in astronomy, a familiar name for the multiple star θ Orionis, which occupies a nuclear position in the great Orion nebula. It consists of four principal stars, 4'7 to 8'0 magnitude, arranged at the corners of a quadrilateral. All the trapezium stars show helium spectra of an early type.

Trapezium and Trapezoid, in geometry, are Euclid's names for plane figures bounded by four straight lines—the trapezium having no two sides parallel, the trapezoid having only two sides parallel. Some later geometers have interchanged the meanings; but there is no reason for departing from the usage of the ancient Alexandrian school.

Trapezus. See TREBIZOND.

Trapping, or snaring wild animals and birds, is in Britain confined to vermin and birds, and the old-fashioned 'gin' trap is the one most commonly used for catching the former. The rabbit too is caught in this way.

Hares and rabbits are also snared with wire nooses, set in gaps in hedges, so that they may strangle themselves in passing through. Crows, rooks, jays, magpies, and hawks are caught with a modification of the gin trap; woodcocks, snipes, plovers, wheatears, and ortolans with springers or springles, which are horsehair nooses. The poacher works with bird lime, made with linseed oil boiled to a sticky consistency and spread on twigs. A clever device is to scatter cones of paper the insides of which have been smeared with bird lime and baited with corn, in suitable places for pheasants, who, in pecking at the corn, effectually mask themselves. The catcher of singing or cage birds works with a 12-ft. net, and with singing decoy birds. The animals trapped in America include bears, wolverines, coyotes, foxes of all sorts, lynxes, raccoons, skunks, otters, beavers, fishers, martens, minxes, and weasels; and the many varieties of gin, 'deadfall,' and snare bear evidence of American ingenuity.

India also is noted for its trappers, who in many cases form a 'caste' of their own. The largest of all traps is the elephant *keddah*, a palisaded enclosure in which a whole herd of elephants can be captured. Panthers are taken in a contrivance resembling the ordinary mouse-trap. In trapping wolves a kid is hung in a basket over a deep staked pit, and just beyond the spring of a wolf. The wolves leap at the kid, and fall into the pit. Large circular earthenware pots are allowed to float on ponds resorted to by wild ducks, until the latter get accustomed to their proximity. The trapper then enters the water with one of these earthenware pots over his head, and holes pierced for his eyes, and wades or swims slowly towards the birds, which he catches softly by the legs and ties to his girdle, where they drown. In Africa there is a primitive way of trapping antelopes, zebras, quaggas, and other animals by driving them into pits. See Batty's *How to Hunt and Trap* (1878), Moorman's *Practical Trapping*, and Har-topp's *Sport in England* (1894).

Trappistine, a liqueur prepared by the Trappist monks of certain French monasteries. Two varieties are in general use—the green and the yellow; the former is much superior.

Trappists, an order of Cistercian recluses founded at La Trappe in Normandy, in the 11th century, by Rotrou, Count de Perche. This Cistercian abbey fell in 1662 to Armand Jean le Bouthillier de Rancé, who became abbot, and ruled with an

unheard-of rigour. All intercourse with the world was cut off, perpetual silence was enforced, and the most rigid system of fasting and disciplinary devotion was inaugurated. The order was dispersed at the revolution, and its members found an asylum at Valsainte in canton Fribourg, Switzerland. They finally dispersed to Augsburg, Munich, Lithuania, and to places in Italy, Spain, and even England. In 1816-17 they bought again their old monastery at La Trappe. In 1880 nearly 1,500 Trappists were expelled from France. There are two Trappist communities in England—one in Leicestershire, the other at Staplehill in Dorset. In Ireland there are two—one at Mt. Mellerey in Waterford, the other at Roscrea in Tipperary. The American centres are at Gethsemane, Kentucky (*Century*, Aug. 1888); New Melleray, Iowa; Tracadie, Nova Scotia; and Oka, on the Ottawa R. See Gaillardin's *Trappistes, ou L'Ordre de Cîteaux au 19 Siècle* (1844); Chateaubriand's *Vie de Rancé* (1844); Pfannenschmidt's *Geschichte der Trappisten* (1873).

Trap-shooting is of very ancient origin, its earliest known form, 'popinjay shooting,' being a pastime known to the early Greeks, who used to shoot with arrows for a prize, the mark being a dove on the top of a pole. In pigeon-shooting proper the bird used is the blue rock-pigeon, perhaps the best variety of which is the Lincolnshire blue rock. The pigeons are placed in traps or boxes at from twenty-two to thirty yards from the shooter. To release the bird, an assistant pulls a line, connected with a mechanical contrivance, which opens the trap. In 'inanimate bird' shooting the trap is a catapult, which throws the clay pigeon, a small saucer-like target, made usually of pitch composition, which breaks if hit by the shot. See A. H. Bogardus's *Field Cover and Trap Shooting* (1874), F. C. Bone's and W. Keep's *A Short Account of Inanimate Bird Shooting* (1894).

Trasimene, LAKE, or LAGO DI PERUGIA or TRASIMENO, a lake in Italy, 12 m. w. of Perugia, famous for the victory gained on its shores by Hannibal over the Romans under the Consul Flaminius in 217 B.C. It was drained into the Tiber in 1898, some 5,500 acres being rendered available for cultivation.

Tras-os-Montes. See TRAZ-OS-MONTES.

Traunsee, or TRAUN LAKE, a beautiful lake in Upper Austria, 7½ m. long, 626 ft. deep, at an alt. of 1,385 ft., and overhung on the E. by the Traunstein (5,450 ft.).

At its N. end is the summer resort of Gmunden, and on its W. shore Traunkirchen.

Trautenau, tn., Austria, in Bohemia, at S. foot of Riesengebirge, 35 m. N. of Pardubitz; centre of linen industry, with coal mines in vicinity. In 1866 the Prussians were here defeated by the Austrians, and on the following day the Austrians by the Prussians. Pop. (1900) 14,777.

Travancore, feudatory state at S.W. angle of India, bounded on W. by the Indian Ocean. It is noted for the beauty and variety of its scenery, its healthy climate, and its fertile soil. Spurs from the Western Ghats stretch towards the ocean; the coast is flat, and is covered with cocoanut and areca-nut palms. Chief products, cocoanut, coir, areca nut, pepper, cardamoms, beeswax, and timber. Cap. Travandrum. Area, 7,091 sq. m.; pop., including 700,000 (Syrian) Christians, (1901) 2,952,157.

Traveller's Joy. See CLEM-ATIS.

Traveller's Tree, a name given to *Ravenala madagascariensis*, a curious palmlike tree, the trunk of which terminates in a cluster of very long leaves with leaf-stalks often ten feet in length. The blades of the leaves are themselves often six feet or more long. The seeds of this tree, ground into flour, are eaten by the natives. The petioles, or leaf-stalks, yield a quantity of excellent drinking water.

Traverse. See SURVEYING AND LEVELLING.

Travertine (*lapis Tiburtinus*), a variety of calc-sinter deposited by springs and rivers richly charged with calcium carbonate in solution. Its formation is principally observed in volcanic countries—e.g. near Rome (Tivoli), Naples, and Florence. Many of the finest edifices in Rome (including St. Peter's), both ancient and modern, are built of travertine, obtained from Porte Lucano, near Tivoli. It is usually white or creamy, often contains casts of leaves, reeds, and branches of trees, and may exhibit a concretionary or a pisolitic structure. Mexican onyx or onyx marble is a beautiful translucent, fine-grained travertine.

Trawling. See FISHERIES.

Traz-os-Montes, or TRAS-OS-MONTES, prov., N.E. Portugal, covers an area of 4,263 sq. m. Wine and olive oil are produced. Cattle and sheep are reared. Minerals are abundant, but little worked. Pop. (1900) 429,170.

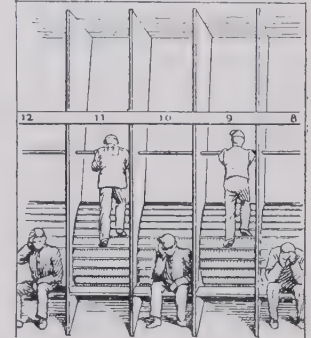
Treacle. See MOLASSES.

Treacle Bible. See BIBLE.

Treacle Mustard, the common name of a native cruciferous plant, *Erysimum cheiranthoides*. See ERYSIMUM.

Treason and Treason Felony

Treadmill, a machine invented by the Chinese, and formerly used as a means of raising water for field irrigation. The treadmill employed in British prisons was the invention of Sir William Cubitt of Ipswich. The first machine was erected in Brixton Jail (1817). The 'hard labour' of prison discipline was formerly the treadmill—a large cylindrical wheel turned on its axis by the tread of a number of prisoners. Now, the crank is generally adopted—a small flaked wheel, similar to the paddle-wheel of a steamer, revolving within a box, which is partly filled with gravel, and turned by the prisoner with a handle outside. By this new system the treadmill can be regulated to the strength of the individual, while the number of revolutions can be registered.



Treadmill—alternate Men working on Wheel.

Treason and Treason Felony. Treason was originally divided into high and petty treason, but the latter, which consisted of the killing of a husband by his wife, of a master by his servant, etc., has been assimilated to other murders. Under those sections of the Treason Act, 1351, which are still in force the following offences are declared to be treasons: compassing or imagining the death of the king, the queen, or their eldest son; violating the queen, the king's eldest daughter unmarried, or the wife of the king's eldest son; levying war against the king in his realm; or being adherent to the king's enemies in his realm, giving them aid and comfort in his realm or elsewhere; killing the chancellor, treasurer, or judges in the execution of their offices. By the doctrine of constructive treason it has long been judicially held that all overt acts whereby the king's life might be endangered, and actual insurrections of a public nature, are high treason. By the Treason Act, 1817, many acts, such as inciting

foreigners to invade any of the king's dominions, and the imprisonment or restraint of the person of the king or his successors, which under the old law would have been regarded as constructive treason, were expressly declared to be treasons. But by the Treason Felony Act, 1848, the treasons in the Act of 1817, except those relating to attempts against the king's person, and those contained in the Act of 1351, were reduced to felonies punishable by penal servitude for life. By the Treason Act, 1842, persons guilty of assaults on the person of the sovereign are liable to seven years' penal servitude and whipping. Since 1870 the punishment for treason in England has been limited to hanging (or beheading if so directed by royal warrant). The execution must still be public. Under the old law the traitor was sentenced, if a man, to be dragged on a hurdle to the place of execution, hanged by the neck, taken down while alive and have his private members cut off, and his entrails torn out and burnt, and then to have the head cut off and the trunk quartered; and if a woman, to be burnt. Some parts of this sentence are still in force in Scotland. Principals in the second degree and accessories before the fact are liable to the same punishment as traitors, accessories after the fact to two years' imprisonment.

Treasure-trove is gold or silver coin, plate, or bullion found hidden in the earth or some other private place, and of which the owner is unknown. It belongs to the crown, and in England it is a misdemeanour to hide it from the crown. When treasure-trove is found the coroner holds an inquest. The Treasury returns to the finder such coins and objects as are not actually required for national institutions, and pays him the antiquarian value of the coins and objects retained, subject to a deduction of ten per cent.

Treasury. The office of lord high treasurer, with which that of treasurer of Scotland was united in 1707, and that of Ireland in 1816, takes precedence after the archbishop of Canterbury, the prime minister, and the lord chancellor. It has always been entrusted to commissioners known as lords of the Treasury since 1714. The board consists of the first lord of the Treasury, who now exercises very little financial control; the chancellor of the Exchequer, who is also under-treasurer; and three junior lords. There are two parliamentary secretaries—the patronage secretary, who is also the chief government whip, and

the financial secretary—and a permanent secretary (first appointed in 1805), who is the head of the civil service of the crown. The financial business of the Treasury now devolves on the chancellor of the Exchequer, and involves the general superintendence of the national finances, the preparation of the annual estimates of revenue and expenditure, the adjustment of taxation to the national requirements, subject to the consent of Parliament, and a general control over the expenditure of all government departments. The political business of the Treasury devolves on the first lord, who is generally prime minister if the prime minister is a Commoner, or else leader of the House of Commons. All departments, such as the Ecclesiastical and Charity Commissioners and the National Galleries, which are not separately represented in Parliament, are represented by the Treasury; and the Post Office, although represented in one house by the postmaster-general, is almost entirely under Treasury control. See also EXCHEQUER, CHANCELLOR OF THE, and TREASURY SOLICITOR.

Treasury Bills form part of the floating debt of England, and are issued at the convenience of the Treasury. They are current for twelve months only, and are generally issued for very short periods. By their means the government is able to take advantage of the market rates.

Treasury Bonds are issued by the United States and some of the British colonies, and correspond to the English Exchequer bonds. They are issued as an acknowledgment of money lent to the Treasury for a limited period. They form part of the floating debt of a country.

Treasury Solicitor, who is nominated by royal warrant, is director of public prosecutions, and king's proctor. By the Treasury Solicitors Act, 1876, he is a corporation sole, and administration may be granted to him on behalf of the king of *bona vacantia*; and by the Intestates Estates Act, 1884, actions may be brought against him in respect of such administration as if he was a private person. See also PUBLIC PROSECUTOR.

Treaties. In England the treaty-making power is part of the royal prerogative, but the king acts on the advice of his ministers. No formalities are necessary for the making of treaties. They are often secret, and may be even verbal; but they are generally negotiated by ambassadors or plenipotentiaries, and are confirmed by governments. A treaty speaks from the

date of its signature or negotiation, not from the date of its ratification, but private persons are not bound by treaties till promulgation. A transitory convention is a treaty which takes effect once and for all—e.g. a cession of territory. And though war involves the suspension both of definite and indefinite treaties, it is doubtful whether it involves their termination. For example, extradition, copyright, and other treaties might *ipso facto* revive after war, while some treaties operate only in time of war—e.g. those dealing with the laws of war. As to treaties for an indefinite period, one view is that they should only be terminated by consent of all parties; another that they are terminated by any material alteration of circumstances; while Prince Gortschakov in 1870 said that any power could withdraw at will at any time from a treaty. In fact, they are terminated by public repudiation, breach, or war. The performance of treaties is sometimes secured by the occupation of territory; but this practice, as well as that of giving hostages, is now confined to treaties after war. See Hall's *International Law* (5th ed. 1904), and for the text of treaties existing between Great Britain and foreign countries, Hertslet's *Treaties* (1820-1905).

Treating. By the Corrupt and Illegal Practices Prevention Act, 1883, any person who by himself or his agent corruptly provides meat or drink before or after an election to another, in order to persuade him to vote or abstain from voting, and also the person receiving such meat or drink, are guilty of treating, which is a corrupt practice. For the penalty, etc., see ELECTIONS.

Trebelli, or GILBERT, ZELIA (1839-92), operatic vocalist, born in Paris of German parentage. She made her début under the name of Trebelli at Madrid (1859), and came to be universally regarded as one of the greatest operatic and concert singers. Her voice was a rich, brilliant mezzo-soprano, and her executive powers were of the highest order.

Trebitsch, tn., Austria, in w. of Moravia, 32 m. w. of Brünn. It has a 13th-century church. Tanning and bootmaking are the chief industries. Pop. (1900) 10,597.

Trebizond (anc. *Trapezus*), seapt. and cap. of vilayet of same name, Asiatic Turkey, near s.e. corner of Black Sea, on a small plateau 110 m. n.w. of Erzerum, is one of the natural outlets of N. Persia and Kurdistan. Its trade, reaching about £2,000,000 annually (two-thirds imports), has somewhat declined since the opening of the Tiflis-Batum rail-

way. The town is fortified and walled. Originally a Greek colony (c. 600 B.C.) from Sinope, which was itself a colony from Miletus, Trebizond in 1204 became the capital of the empire of Trebizond under Alexius Comnenus; in 1461 it was captured by Mohammed II. of Turkey. In October 1895 the town was the scene of Armenian massacres. Pop. 40,000.

Treble, the name given to the highest part in concerted vocal or instrumental music. See CLEF.

Trebonius, GAIUS, Roman tribune in 55 B.C. Cæsar made him one of his lieutenants in Gaul; in 48 he was prætor, and in the next year governor of Further Spain. In 45 Cæsar made him consul; yet he was one of the most energetic of the conspirators against him. After Cæsar's death he went to his province of Asia, but in 43 B.C. Dolabella surprised him at Smyrna, and killed him. He is introduced by Shakespeare in his *Julius Cæsar*.

Tredegar, tn., Monmouthshire, England, 16 m. N.W. of Pontypool; has iron and steel works, and coal is mined. Pop. (1901) 18,574.

Tredgold, THOMAS (1788-1829), English architect and engineer, was born at Brandon, near Durham. In 1813 he joined William Atkinson, architect to the Ordnance, in London, and in 1823 went into private practice as a civil engineer. He wrote *Elementary Principles of Carpentry* (1820), *Strength of Cast Iron* (1821), *The Steam-engine* (1827).

Tree, any woody plant that rises from the ground as a distinct trunk. See further at FORESTRY.

Tree, HERBERT BEERBOHM (1853), English actor and theatrical manager, was born in London, and made his début at the Globe Theatre, London, as Grimaldi (1878). In 1884 he made a hit as the Rev. Robert Spalding in *The Private Secretary*. He was afterwards manager of the Comedy, the Haymarket, and Her Majesty's Theatres, where he produced *The Red Lamp*, *A Man's Shadow*, *Captain Swift*, *Beau Austin*, *The Ballad-monger*, *The Merry Wives of Windsor*, *The Dancing Girl*, *Hamlet*, *Hypatia*, *The Tempter*, *John-a-Dreams*, *Seats of the Mighty*, and other plays. He has also lectured on the modern drama and the actor's art. His wife and his daughter Viola are also accomplished actresses.

Tree-fern, a fern with a trunklike caudex. Among the genera are *Alsophila*, *Cyathea*, and *Dicksonia*.

Tree-frogs (Hylidæ), a family of amphibians more nearly related to toads than to frogs.

Throughout Europe (not Britain), N. Africa, and much of Asia there occurs the little *Hyla arborea*, which is often kept in ferneries. It does not exceed two inches in length, and is grass green above and yellowish below, with a rosy tint on the thighs. Both the fingers and the toes bear adhesive discs. The food consists of insects, and the frogs are entirely arboreal in habit. The male has a vocal sac, which when inflated is larger than the head; the croaking is exceedingly loud for the size of the animal. In Germany it is believed to foretell rain. As in the toad, the skin produces a poisonous secretion. Tree-frogs are widely distributed, being specially numerous in America. Most lay eggs in water, but in the American genus *Notothema* the eggs are placed in a pouch on the back of the mother, and there undergo the greater part of their development.



Tree-frog.

Treenail, a pin made of hard wood. See NAILS.

Tree-nettle. See NETTLE-TREE.

Tree-worship, a very ancient universal cult. It was prevalent among the Lithuanians prior to the 14th century, the oak being specially revered. The oak also was sacred to the Greeks, the Celts, and the Slavs, and very specially to the Druids of Britain. The Romans worshipped the sacred fig-tree of Romulus. Tree-worship originated in the primitive belief that in trees, as in all plants, there dwelt a god or spirit, who in some cases had the power of detaching himself from the tree at will. This latter idea is still prevalent among many tribes of Africa and the Eastern Archipelago, and the natives of the Slave Coast will not fell a tree unless they have reason to believe that the spirit is temporarily absent. The East African Gallas offer sacrifices to their consecrated trees, and women are not permitted to approach them. Formerly in Great Britain the young men and maidens of each village used to sally forth into the woods, returning laden with green boughs, known as 'May bushes,' which they placed above their doors as a protection against evil influences. At the same time, a

young tree, cut in the woods and stripped of its branches, was erected as a 'May pole' or 'summer tree,' and around it the country folk danced and sang. This practice was in vogue in 16th-century Scotland, and in England it flourished down to later times. At the present day the mountain ash is still held to be a safeguard against witchcraft in Scotland. A mass of information on the subject of tree-worship, past and present, is contained in Dr. Frazer's *Golden Bough* (2nd ed. 1900). See also Mannhardt's *Der Baumkultus der Germanen* (1875), Fergusson's *Tree and Serpent Worship in India* (1873), and Andrew Lang's *Myth, Ritual, and Religion* (1901).

Trefoil, a name applied to a large number of plants, including the various species of the genus *Trifolium*, *Lotus corniculatus*, and *Melilotus*. *Medicago arborea* is sometimes known as the moon trefoil, *Anemone hepatica* as the golden trefoil, and *Jasminum fruticans* as the shrubby trefoil.

Tregelles, SAMUEL PRIDEAUX (1813-75), English Biblical scholar, was born at Falmouth, and was engaged in teaching before he took up the work of his life, the study of the text of the New Testament. The first part of his text was published in 1857, the seventh and last in 1879. He published also *An Account of the Printed Text of the Greek New Testament* (1854), and edited various dictionaries of Greek and Hebrew.

Tréguier, seapt. tn., dep. Côtes-du-Nord, France, 56 m. W.N.W. of St. Malo; has a cathedral, and was the birthplace of Renan. Pop. (1901) 3,297.

Treitschke, HEINRICH GOTTHARD VON (1834-96), German historian and political essayist, was born at Dresden, and appointed professor successively at Freiburg (1863), Kiel (1866), Heidelberg (1867), and Berlin (1874). He was editor of *Preussische Jahrbücher* from 1866 to 1889, and from 1895 of *Die Historische Zeitschrift*. Always a warm and enthusiastic patriot, after the Franco-German war he became a bitter enemy of Britain, and supported Bismarck's policy of holding Britain in check. His chief work was his *Deutsche Geschichte im 19. Jahrhundert*, in which he had only reached the year 1847. Other works are *Historische und Politische Aufsätze* (1886; 5 vols. 1896), *Zehn Jahre Deutscher Kämpfe* (1874-96), and *Politik* (1897). See Schiemann's *Life*, in German (1896); also *Deutsche Rundschau* (October 1896), and *Historical Review* (December 1897).

Trelawney, EDWARD JOHN (1792-1881), English author and

adventurer, born in London. Having entered the navy, he deserted his ship at Bombay, and for six years led a life of adventure in the Eastern Archipelago. In 1822 he met Shelley and Byron in Italy, and was at Leghorn when Shelley was drowned, and performed the last services to his body. In 1823 he accompanied Byron to Greece, and took part in the war of independence. Trelawney's life is described in his *Adventures of a Younger Son* (1831), and *Records of Shelley, Byron, and the Author* (1858).

Trelawney, SIR JONATHAN (1650-1721), held successively the bishoprics of Bristol, Exeter, and Winchester. In common with six other bishops, Trelawney was, in 1688, tried on the ground of protesting against the Declaration of Indulgence issued by James II., but was acquitted. He joined William of Orange. He is probably best known from Hawker's lines, 'And shall Trelawney die?' etc.

Tremadoc Slates, the uppermost subdivision of the Cambrian rocks of Britain. See CAMBRIAN.

Trematodes, or FLUKES, are parasitic flatworms. The majority are external, but a few are internal and dangerous. The ectoparasitic forms are found especially on the gills of fishes. Examples are *Diplozoon* and *Polystomum integerrimum*, which in the young stage is found on the gills of the tadpole, and as an adult in the bladder of the frog. The adult lays its eggs in the water by protruding its body through the cloacal orifice of the frog. The endoparasitic forms have always two hosts, and are hence classified as Digenea, in contrast to the ectoparasitic forms, which are called Monogenea. Examples of the Digenea are the liver-fluke and Bilharzia.

Tremolite. See AMPHIBOLES.

Tremolo, as a term in instrumental music, signifies that the notes are to be rapidly reiterated during their time values, instead of being played as sustained sounds. In vocal music the word is used to designate the wavering effect produced when the voice is caused or allowed to become unsteady.

Trench, the term for a submarine elongated but proportionately narrow depression, with steeply sloping borders, one of which (continental) rises higher than the other (oceanic). Trenches are the ends of unsymmetrical basins, and lie beside the continental border or island chains. The Cayman trench (off S.E. United States) alone runs between islands.

Trench, RICHARD CHEVENIX (1807-86), archbishop of Dublin. After holding the curacy of Hadleigh, the incumbency of Curd-

ridge, and the curacy of Alverstoke under Samuel Wilberforce, Trench was in 1847 appointed to the chair of divinity at King's College, London, to the deanery of Westminster in 1856, and to the archbishopric of Dublin in 1863. To him we owe *Notes on the Miracles* (1846), *Notes on the Parables* (1841), *Lessons in Proverbs* (1853), *Hulsean Lectures* (1845), *English Past and Present* (1855), *The Study of Words* (1851), *Glossary of English Words* (1859), *Sacred Latin Poetry* (1849). See his *Letters and Memorials* (1886).

Trenck, BARONS VON DER, two German military adventurers, cousins. Franz (1711-49) was born at Reggio in S. Italy. After serving in the Russian army and being imprisoned for insubordination, he raised at his own cost a force of irregular cavalry (Pandours) to aid the Empress Maria Theresa in the Seven Years' war. With them he made his name a terror in Bavaria and Alsace, and being called upon to answer for their excesses, he was imprisoned for life in the Spielberg at Vienna, where he committed suicide. See his *Autobiographie* (2 vols. 1748-1807).—FRIEDRICH (1726-94) was born at Königsberg. He incurred the ill-will of Frederick the Great of Prussia owing to a love affair with that king's sister Amelia, and was twice imprisoned (1745-6; 1753-63). After visiting England (1774-7) and France, he entered the service of Maria Theresa; but returning to Paris, he was seized and guillotined as an agent of Austria. See his *Selbstbiographie* (3 vols. 1787) and his *Sämtliche Gedichte und Schriften* (8 vols. 1786).

Trendelenburg, FRIEDRICH ADOLF (1802-72), German philosopher, born at Eutin, near Lübeck, and became (1833) professor of philosophy at Berlin. His aim was to prove the essential unity of the Platonic and Aristotelian philosophies, and that the latter is but the copestone of the former. His chief works are *Elementa Logices Aristotelicae* (1837), *Logische Untersuchungen* (1840), *Das Naturrecht auf dem Grunde der Ethik* (1860). See *Life* in German by Bratuschek (1873).

Trent (anc. *Tridentum*), tn., Tyrol, Austria, on l. bk. of Adige, 44 m. N.E. of Verona; has silk-weaving, and manufactures of pottery and salami (sausage). Wines are produced, and gypsum and marble are quarried. It is fortified, and is the seat of a bishop. Pop. (1900) 24,908. Its church of Santa Maria Maggiore was the meeting-place of the famous Council of Trent, between 1545 and 1563. The Protestants refused to acknowledge this 'as a free and general council.' After

making some declarations in favour of the papacy, the council was moved to Bologna, but re-assembled at Trent in 1551. In 1552, however, it was suspended. The third session of the council (January 1562 to December 1563) reaffirmed the old doctrines with respect to the sacraments, indulgences, purgatory, and the invocation of saints. In addition, reforms were drastically carried out in the church, the discipline of the clergy was enforced, and the abuse of pluralities was checked.

Trent, riv., England, rises in N.W. Staffordshire, flows through the counties of Derby, Leicester (N.W.), Nottingham, and Lincoln to the junction of the Ouse with the Humber. Tributaries—Dove, Derwent, Idle, Sow, Tame, and Soar. Navigable for barges to Burton. Length, 170 m.; area of basin, 4,080 sq. m.

Trent Affair. In 1861 Captain Wilkes of the United States Federal war steamer *San Jacinto* boarded the British mail-packet *Trent* on her way from Havana to St. Thomas, and carried off two Confederate envoys then on their way to Europe, Messrs. Slidell and Mason. They were imprisoned; but the British government demanded their surrender—a demand complied with on January 1, 1862.

Trente-et-Quarante. See GAMBLING.

Trenton. (1.) City, cap. of New Jersey, U.S.A., co. seat of Mercer co., situated at the falls of the Delaware. Chief manufactures: pottery, for which the city is famous; iron and steel, rubber goods, and machinery. Here Washington surprised and captured a British force in 1776. Pop. (1900) 73,307. (2.) City, Missouri, U.S.A., co. seat of Grundy co., on Grand R., 85 m. N.E. of Kansas City. Pop. (1900) 5,396.

Trenton Falls, popular summer resort, Oneida co., New York, U.S.A., 17 m. by rail N. of Utica; has five picturesque waterfalls, by which the river drops nearly 400 ft. in 2 m., through gorges.

Trepang. See BÊCHE DE MER.

Trepbine, or TREPAN. A trephine is a surgical instrument for cutting a circular piece of bone from the cranium. The operation is performed for simple depressed fracture of the skull, with compression of the brain; compound fracture; extravasation of blood below the cranium; and the formation of an intracranial abscess. Trephining may also be performed for the removal of a bullet, and in some cases of epilepsy. Bones other than those of the cranium are occasionally trephined to allow of the escape of pus formed in the interior of the bone.

Trespass. (1.) Trespass to land originally consisted in breaking and entering the plaintiff's close, but it is extended in practice to all injuries to corporeal property—e.g. shooting over the land, driving a nail in the boundary wall, allowing water to escape on to the land, letting animals stray on to the land. Trespass is a tort or civil wrong, for which damages proportioned to the injury, and an injunction to restrain a repetition of the trespass, may be claimed. Trespassing is not in itself a criminal act; but some criminal acts, such as poaching, mushroom-gathering, and house-breaking, are also trespasses. The action must be brought within six years of the tres-

years. In Scotland the term trespass is confined to trespasses to land. It is not ordinarily a criminal offence, and the owner is not entitled to remove the trespasser by force, unless the trespass is to a building; but he can obtain an interdict to prevent its recurrence. By the Trespass (Scotland) Act, 1865, it is an offence, punishable by a fine of twenty shillings or fourteen days' imprisonment, to lodge in any premises, or occupy or encamp on private land, or light a fire on or near a private road, without the consent of the owner. The prosecution must be by the procurator fiscal. Trespass may be justifiable in exercising a legal right, or by invitation of the

to India as minister of finance. Trevelyan instituted many reforms, and was a pioneer of education in India.

Trevelyan, SIR GEORGE OTTO (1838), English statesman and man of letters, was born at Rothley Temple in Leicestershire. He became chief secretary for Ireland in May 1882, a few days after the murder of Lord Frederick Cavendish in Phoenix Park; but resigned the office two years later, with prematurely whitened hair. He entered the House of Commons in 1865, and retained a seat in it till 1897. In the interval he was successively a lord of the Admiralty (1868); secretary to the Admiralty (1880-2); chief secretary for Ireland (1882-4);



Trèves.

(Photo by Frith.)

pass. (2.) Trespass to goods consists in taking or injuring the goods of another—e.g. beating the plaintiff's dog, wrongful removal, illegal distress, or theft. The plaintiff must be in actual or constructive possession of the goods at the time of the trespass. His remedy is in damages. Of course trespass to goods is generally also criminal, and the civil action is not common. (3.) Trespass to the person includes any tort whereby the person is injured, and its various forms are discussed under ASSAULT, FALSE IMPRISONMENT, NEGLIGENCE, SEDUCTION. A husband or parent can sue for a trespass to a wife or child. The action must be brought within four

years, or by accident or necessity; but if such legal right is abused, the act of trespass becomes an *ab initio* one.

Tres Tabernæ ('Three Taverns'), a station on the Appian Way, in Latium, ancient Italy, probably about 3 m. s. of the modern Cisterna. It is mentioned in the Acts of the Apostles.

Trevelyan, SIR CHARLES EDWARD (1807-86), governor of Madras, entered the Bengal civil service under the East India Company. He became assistant secretary to the Treasury, and governor of Madras in 1859. Owing to a disagreement with the government on the subject of fresh taxation, Trevelyan was recalled; but in 1862 he returned

chancellor of the Duchy of Lancaster, with a seat in the cabinet (1884-5); and secretary for Scotland from February to April 1886, and from 1892 to 1895. He separated from Gladstone in 1886 on the Home Rule question, but in 1887 he seceded from the Liberal Unionists and rejoined the Gladstonians. It was to Sir G. Trevelyan, more than to any other man, that the abolition of purchase in the army and the enfranchisement of the agricultural labourer were due. He is a nephew of Lord Macaulay, and wrote his *Life* in 1876. Other works are *The Early History of Charles James Fox* (1880), *The American Revolution* (1899-1905), and *Interludes in Verse and Prose*

(1905). Hisson, George Macaulay Trevelyan (1876), has published *England in the Age of Wycliffe*, and *England under the Stuarts*.

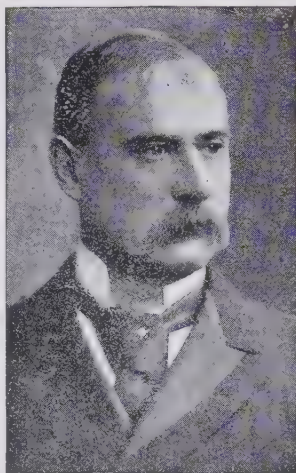
Trèves (Lat. *Augusta Trevirorum*; Ger. *Trier*), tn., Rhine Province, Prussia, on r. bk. of Moselle, 69 m. by rail s.w. of Koblenz; has manufactures of woollens, cottons, linens, and leather, but is especially noted for its rich Roman remains. These include the basilica or palace of Constantine, now used as a Protestant church; the Porta Nigra, a fortified gate dating from the 4th century; an amphitheatre, capable of accommodating 30,000 spectators; the imperial palace; baths, in capital preservation; and the piers of the river bridge. In the cathedral, built on the site of a 4th-century basilica, are preserved a nail reputed to be from the cross, and the 'Holy Coat,' brought to Trèves by the Empress Helena, and exhibited as lately as 1891 to two million pilgrims. Other buildings are the Provincial Museum, the church of Our Lady, and the Municipal Library, containing very valuable MSS. Originally the capital of the Treviri, Trèves became a Roman colony, and during the 3rd and 4th centuries was a favourite residence of the Roman emperors. From the beginning of the 9th century till 1786, when the electorate was transferred to Koblenz, Trèves was an archbishopric of very great importance. The French took the city in 1794, and it was for a time the capital of the department of Sarre. From 1473 to 1797 it was the seat of a university. Pop. (1900) 43,506.

Treves, Sir Frederick (1853), English surgeon, was born at Dorchester. He rapidly acquired a great reputation as one of the most skillful of surgeons, while as lecturer on surgery at the London Hospital he proved himself a teacher of no common type. In 1900 he was consulting surgeon to the forces in S. Africa, and in the same year was appointed surgeon-extraordinary to Queen Victoria. It was he who operated on King Edward for appendicitis, and so earned a baronetcy. In 1905 he was elected lord rector of Aberdeen University. He has published *The Other Side of the Lantern* (1905), and works on anatomy and surgery, including *System of Surgery*, *Manual of Operative Surgery*, *Surgical Applied Anatomy*, and *Tale of a Field Hospital*.

Trevisa, John de (1326-1412), English author and translator, was born in Cornwall, and was a fellow of Exeter College, Oxford (1362-9), and of Queen's (1369-79). He entered the service of Lord Berkeley about 1387, and for this patron translated

many Latin works into English, including Higden's *Polychronicon* (1387), with notes, and a continuation down to 1360; and Glanville's *De Proprietatibus Rerum*. Those translations are of value as specimens of Early English prose.

Treviso (anc. *Tarvisium*), city and episc. see, cap. of prov. of same name, Italy, 18 m. N.W. of Venice; has manufactures of iron goods, pottery, silks, and woollens. Among its famous buildings are its 15th-century cathedral (containing Titian's *Annunciation*) and the Gothic church of S. Niccolo. Pop. (1901) 32,793.



Sir Frederick Treves.
(Photo by Lafayette, Dublin.)

Trevithick, Richard (1771-1833), English inventor, who may contest with Watt and with Stephenson the glory of the invention of the locomotive steam-engine, was born in Cornwall. Becoming a mining engineer, he began to make improvements on the steam-engine, and in 1796 exhibited models of steam-locomotives, and introduced the high-pressure principle; but he failed to secure financial backing, and most of his experiments and inventions had little practical result.

Trevor, Sir John (1637-1717), British judge, was born in Denbighshire. He was called to the bar in 1661, knighted in 1670, and became king's counsel in 1683. As a judge Trevor was wise and able, but as a politician utterly unscrupulous, and in private life a confirmed gambler. His greed in taking bribes eventually led to his expulsion from the house, after having held the offices of Speaker, master of the rolls, and commissioner of the great seal.

Trial. Trials are either criminal, which must be on the evi-

dence of witnesses heard in court, or civil, where the evidence may either be oral or by affidavits. In criminal trials the first step is the arraignment of the prisoner, and his plea of guilty or not guilty. If he pleads guilty, he is then asked in cases of felony whether he has any reason to give why the court should not pronounce sentence. He is entitled to be heard by himself or by his counsel in mitigation of sentence. He may also bring evidence as to character, which may be rebutted on behalf of the prosecution. The judge then passes sentence. If the prisoner pleads not guilty, the jury are sworn, both the crown and the prisoner having their right of challenge. In cases of felony the clerk of the court states the effect of the indictment to the jury; counsel for the crown then opens the case for the prosecution, and calls his witnesses, who are cross-examined for the defence. If the prisoner is represented by counsel, the counsel for the prosecution has the right to make a second speech, after the speech for the defence, if evidence other than that of the prisoner is called; in other cases before. The law officers for the crown have a right of reply whether evidence for the defence is called or not. The judge then charges the jury, who bring in their verdict.

In civil cases before a jury, after the opportunity of challenge, the plaintiff's junior counsel opens the pleadings to the jury, and then the leading counsel for the party on whom the burden of proof lies states his case; the witnesses for that party are then called, and in turn cross-examined. On the conclusion of the case for the plaintiff, counsel for the defendant states whether evidence will be called or not. If no evidence is called, the leading counsel for the plaintiff sums up his case, the defendant's leading counsel is heard in reply, and the judge charges the jury. If evidence is called on the part of the defendant, his counsel opens his case to the jury, and then calls his witnesses, who are examined and cross-examined, as in the case of the plaintiff; the defendant's leading counsel then sums up (in the county court only one speech is allowed to the defendant), the plaintiff's leading counsel replies, and the judge charges the jury. After the jury have found their verdict (which must be unanimous unless both parties consent to a verdict by the majority) the judge gives judgment, either in accordance with the verdict, or *non obstante verdicto*, or he may leave the successful party to move for judgment. Where the trial is before

the court without a jury the proceedings are similar, *mutatis mutandis*, the judge taking the place of the jury and finding the facts as well as deciding the law. If objection is taken to any question or document, both the counsel for each side are entitled to be heard, with a reply by the leading counsel for the objector. In trials by affidavit all the counsel on either side are entitled to be heard, with a reply by the leading counsel for the party who begins. In Ireland trials are conducted in the same manner as in England. In Scotland, in criminal trials a verdict of not proven may be given. In all cases the verdict may be given by a majority. On objections, as a rule, only one counsel on each side is heard.

A new trial may be granted under the following circumstances: misdirection by the judge, improper admission or rejection of evidence, the verdict being against the weight of evidence, the damages being insufficient or excessive. In the High Court the application is to the Court of Appeal. In the county court the application is made to the judge, from whom an appeal lies to the divisional court on the ground that his decision was wrong in law. In criminal cases a new trial can only be ordered in the case of a misdemeanour tried in the King's Bench division, and in case of acquittal, only if the defendant, if convicted, would not be liable to imprisonment.

Trial by Combat. See BATTLE, TRIAL BY.

Triangle. (1.) Any figure bounded by three lines which meet at three angles. When the lines are straight lines the triangle is a plane triangle. But triangles may also be built up of curved lines, such, for example, as triangles formed on a spherical surface. The early books of Euclid's geometry deal largely with the properties of triangles, such as the conditions of equality between two, the comparison of areas of triangles, questions of similarity, and the like. The relations of a plane triangle to the inscribed, escribed, and circumscribed circles form a most fascinating branch of mathematics. The important department of mathematics known as trigonometry took its rise from the study of the triangle. (2.) A form of percussion instrument used in military bands, and occasionally in orchestral music. It consists of a steel rod bent into the form of an isosceles triangle open at one angle of its base; is held by a string attached to its upper angle; and is sounded by striking it lightly with a short steel rod termed the 'beater.'

Triangulation. See SURVEYING AND LEVELLING.

Triangulum, an ancient constellation situated between Andromeda and Perseus. The brightest star is β , of 3.0 magnitude. R. Trianguli varies from 7.3 to 11.4 magnitude in a period of 268 days.

Triangulum Australe, a small southern constellation south-east of Lupus, added by Bayer in 1603. The principal star, α , is of 1.9 magnitude; δ is closely double; R, S, T, and U Trianguli Australis are short-period variables.

Triassic. The Triassic system, the oldest of the Mesozoic formations, was at one time united with the Permian under the name New Red Sandstone, a name which is still extensively used in England. The system covers large areas in England, especially in the Midlands, and is represented also in Scotland and in Ireland. It is the most widespread group of rocks in Germany. The lowest beds are known as the Bunter. They are principally a group of red or mottled sandstones and shales, with a set of conglomerates or pebble beds somewhat above the base of the system. The middle subdivision of the system is a limestone, the Muschelkalk. The Upper Trias, or Keuper, attains great importance in Warwickshire and in Cheshire, being sometimes about 2,000 ft. thick. Red marls are its principal members; they contain valuable deposits of rock salt, which are worked at Northwich and Middlewich in Cheshire, and at Droitwich and Stoke in Worcestershire. A thin group of limestones and shales, the Rhaetic or Penarth beds, occurs at the top of the Trias, and forms a natural and conformable transition to the Jurassic. The British Triassic rocks are barren of fossils, though the sandstones of Elgin have yielded a number of remarkable reptilian forms (Telerpeton, Gordonina, Geikia). The German Triassic exhibits the same poverty, though in the Muschelkalk limestone shells of molluscs and cephalopods occur in considerable numbers. In most respects the British and German Triassic resemble one another so closely that they must have been laid down under essentially similar conditions. These were the presence of continental masses of land, having large inland basins, with a small rainfall. Deserts, covered with sand and rounded stones brought down from distant hillsides by occasional rain floods, inhabited by a scanty vegetation, and peopled by few animals, with scattered saline lakes exposed to active evaporation and subject to desiccation,

were the characteristic scenery of the New Red Sandstone period in N. Europe. The economic products of the New Red Sandstone are principally rock salt and gypsum. In the Midlands the sandstones of this system are important water-bearing strata. One group (in the Keuper beds) is known as the Waterstones. The hard brewing waters of Burton-on-Trent come from the Trias. The sandstones often form escarpments and terraces—a tendency which is sometimes accentuated by faulting.

Triassic rocks of the British and the German type occur in the south of Sweden, France, Heligoland, Algeria, and Roumania. Outside of Europe they are found in India, Australia, Argentina, and S. Africa ('Karoo beds'). They appear also, with very much the same facies, in Connecticut and New Jersey, where the numerous large reptilian footprints on the bedding planes of the sandstones have long been famous. A more marine type of the Trias is largely developed in the W. Alps. It is very richly fossiliferous, and contains many limestones, abounding in shells which exhibit characteristics linking the Palaeozoic with the Mesozoic forms of life. This pelagic or Alpine type recurs in the Balkans, Apennines, Himalayas, Peru, California, Alaska, and Japan. The characteristic Mesozoic family of the ammonites is of great importance in the Alpine Triassic; the belemnites also appear; the Palaeozoic genus *Orthoceras*, which had long predominated, now disappears. Many new forms of brachiopods and molluscs are first met with in these beds. The earliest known mammals come from the Rhaetic strata; though some authorities consider that the fossils in question may possibly be reptilian. The highly picturesque dolomite mountains of Tyrol consist of strata belonging to the Alpine Trias.

Tribe; one of the earliest forms of social organization. The tribe was an association of individuals, or of groups of individuals, claiming descent from a common male ancestor, whose name the tribe frequently bore, and governed by a chief who in an especial degree represented, by direct descent, the hero ancestor of the tribe. There is some probability that this legendary ancestor was originally the totem of a group. The tribe develops with the domestication of animals, and is therefore nomadic and pastoral; and the tribal organization may be said to be characteristic of the pastoral stage. Many of the mistakes in Indian land legislation were due

to the fact that the surviving tribal customs were neglected; but these mistakes are now being remedied.

The British tribal system is set forth in the Brehon laws of Ireland and in the ancient codes of Wales. A Cymric tribe was based on blood relationship, recognized to the ninth degree, within which all were united in a group. Minor groups within this group were the landholding units. After the final conquest of Wales by Edward I., the country was found to be divided up into areas, each owned by such a unit under very complicated conditions of individual tenure. The lawyers of Queen Elizabeth swept away the system, and substituted for it the system of leases for lives. The influence of the Romans was in general fatal to the tribal system, and it is doubtful how far they understood it. The tribal system of the North American Indians is probably more generally known than understood. See Seeborn's *Tribal System in Wales* (ed. 1904) and *The Structure of Greek Tribal Society* (1895), Lewis's *Ancient Laws of Wales*, Skene's *Celtic Scotland* (1886-90), O'Curry's *Manners and Customs of the Ancient Irish* (1873), Jenks's *Law and Politics in the Middle Ages* (1898), Fustel de Coulanges's *The Origin of Property in Land* (1891).

Tribonianus, Roman jurist, who, with sixteen coadjutors, by direction of the Emperor Justinian, compiled (530-33) the digest of Roman civil law entitled the *Pandects*. He was successively quaestor, consul, and master of the offices to Justinian, continuing in office till his death (545).

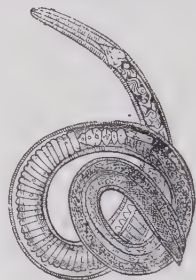
Tribune, the designation of various officials at ancient Rome. (1.) Tribune of the commons (*tribunus plebis*), magistrates granted to the commons (*plebs*) after the secession to the Sacred Mount in 494 B.C. Their persons were inviolable. At first there were two, then five, and after 449 ten. They were elected by the commons in the *comitia tributa*, or assembly of the tribes. The original purpose of their existence was to secure plebeians protection against the tyranny of the patricians; but they could only do this in person, and within the city boundary. By degrees their power was developed into the right of veto, by which they could put a stop to all public business, and the acts of all magistrates except a dictator. Yet their power was chiefly negative: it was only when the decrees of the *comitia tributa* became laws (after 287 B.C.) that they undertook most of the legislation of the state. By that time they had become the intermediaries between the senate and the people,

and had also gained the right of first attending, and afterwards of themselves calling, meetings of the senate. But though the tribunate became eventually the supreme civil power in the state, it was never a magistracy in the proper sense. Sulla in 81 B.C. reduced its power by restricting the veto to the mere protection of individuals, and by prohibiting an ex-tribune from holding any higher office. Its full powers were restored by Pompey in 70 B.C.; and tribunes such as Clodius in the last days of the republic reduced the constitution to a deadlock by vetoing all business. The emperors found it useful to hold the tribunician power (*tribunicia potestas*) as the basis of their civil authority. Its bestowal on any other man than the emperor marked his selection as successor to the throne. Ordinary tribunes, however, also existed under the empire down to the 4th or 5th century A.D.; but the office was a mere title. (2.) Military tribunes with consular power were appointed by the senate, from 444 to 367 B.C., instead of consuls. The office was open to both patricians and plebeians; though no plebeian was elected to the office before 400 B.C. They were six in number. The office was regarded as less dignified than that of consul, though their powers were the same. (3.) Military tribunes were the officers of the legion. There were six to each legion, who took it in turn month by month to command. Originally nominated by the consuls, after 362 B.C. the people were allowed to elect six out of the usual twenty-four required for four legions, and after 207 the whole twenty-four.

Tribune, THE, a London daily newspaper, began its career on Jan. 15, 1906. It was founded by Mr. Franklin Thomasson as an organ of thorough-going Liberal opinion for what may be called 'the penny public'—the three other London Liberal dailies being published at the price of a halfpenny. The managing editor is Mr. William Hill, who was associated with Mr. W. T. Stead on the *Pall Mall Gazette*, and was afterwards concerned in the foundation of the *Westminster Gazette*. With him is associated, as political director, Mr. L. T. Hobhouse, for some years leader writer to the *Manchester Guardian*; while Mr. William Archer is the dramatic critic. One signal new departure in journalism has been made by the *Tribune* in establishing a 'rendezvous and political information department' for the benefit of social and political workers. To the *Tribune* also belongs the credit of initiating an 'Ellen Terry

Jubilee Shilling Fund' in honour of the great English actress.

Trichina (*Trichina spiralis*), a minute parasite, belonging to the nematodes or thread-worms, which occurs in man, the pig, the rat, as well as in most domesticated and a number of wild mammals. The life-history is as follows:—The adults are found in the encysted state in the muscle, say, of the pig. If such trichinized meat be eaten uncooked or imperfectly cooked, the cyst dissolves in the intestine, and the trichinæ are set free. In the course of a few days they become sexually mature, and copulation occurs. The fertilized eggs then hatch within the body of the mother, and the minute embryos are liberated. These bore through the wall of the intestine, and are carried in the blood-stream to different parts of the body, where they come to rest in the muscles, especially those of the shoulder and lumbar region, and in the dia-



Trichina spiralis.

phragm. Here each little worm becomes spirally twisted, and forms around itself a spindle-shaped cyst in which it may lie dormant for years, the walls of the cyst usually becoming calcified. Further development is impossible unless the infected muscle is swallowed by a new host. The number of larvæ may be enormous: Leuckart reckoned that one host might contain from thirty to forty millions. As to methods of infection, man is infected by the pig, which may acquire the parasite from the rat or from another pig, for the uncooked offal of a pig is often given to other pigs to eat.

Trichiniasis, or TRICHINOSIS, the disease caused by the wanderings of the larvæ of the parasitic worm *Trichina spiralis* in living tissues. In some cases the ingestion of meaty flesh causes speedy sickness and diarrhoea, with other symptoms of gastro-intestinal irritation; but more usually it is only a week later, when the migration of the larvæ begins, that the patient feels seriously ill. At this stage the disease is attended by

rise of temperature and extreme prostration, with pain and swelling of the muscles, great acceleration of the pulse and respiration, profuse sweating, and diarrhœa. Nervous irritability is always marked, and paralysis of the muscles and delirium sometimes supervene. Death frequently ensues at this stage. Convalescence is frequently prolonged and tedious, while the prostration caused by the disease often contributes to the patient's death from complications or intercurrent disease. If the patient can be treated before the trichinæ have left the stomach, emetics and lavage by means of the stomach tube are useful. Drastic purgatives may also help to expel the parasites before they reach maturity and produce larvæ. When the newly-born embryos begin to migrate, such treatment is not only useless but harmful, and the physician's aim must be to preserve the patient's strength by concentrated foods and frequent stimulation. During convalescence similar efforts should be made to build up the system by liberal diet and by tonics. Prevention of the disease is easily secured by efficient cooking.

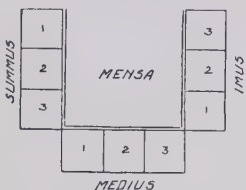
Trichinopoli, munic. tn. and cap. of Trichinopoli dist., Madras Presidency, India, on r. bk. of Cauvery, 30 m. w. of Tanjore. The city includes the fort and the military cantonment. On the summit of a steep rock (273 ft.) are two temples, which attract crowds of pilgrims. Trichinopoli is noted for its cigars, hardware, and gold and silver jewellery. It is a mission centre for both Roman Catholics and Protestants, and has two colleges affiliated to the University of Madras. Bishop Heber of Calcutta died here in 1826. Pop. (1901) 104,690. The district has an area of 3,651 sq. m.

Trichomanes, a genus of ferns, mostly inhabitants of tropical countries. The sori are marginal, and occur at the end of a vein. The plants mostly require stove cultivation, a mixture of sand, peat, and potsherds being a suitable compost. The creeping kinds should have pieces of wood or soft sandstone over which to creep. There are a great number of very beautiful species, including the native Killarney fern or cup goldilocks (*T. radicans*).

Tri-chromatic Printing. See PRINTING and PROCESS WORK.

Triclinium, in an ancient Roman house, a couch which ran round three sides of a table, leaving one end free for serving the dishes. Each part of the couch accommodated three guests (sometimes four), who reclined on their left sides, and in each part the place to the right, look-

ing from the table, was the highest place. The host lay sometimes, if not always, in the middle of the middle couch. The word



Plan of Triclinium.

is also used for the dining-room of a Roman house, which usually opened off the peristyle.



Posture at Table.

Tricolor. See FLAG.

Tricoupis, two Greek statesmen. SPIRIDION TRICOUPI (1788-1873) was born at Missolonghi, and fought against the Turks in the war of independence. On freedom being obtained he became minister of foreign affairs (1843), minister of instruction, vice-president of the senate (1844-49), envoy extraordinary to London (1835-38 and 1841-43) and Paris. He also wrote a standard work, *History of the Greek Revolution* (1853-57). — CHARILAOS TRICOUPI (1832-96), born at Nauplia, son of the above, began (1852) his diplomatic career as attaché in London, and rose to be *chargé d'affaires* there (1863). In 1866 he became minister of foreign affairs, and in 1875 was called for a few months to be prime minister. But not till 1882 had he a sufficient following to impose his policy on the country, which was, by means of a strong army and navy, to give Greece a commanding place in S.E. Europe. His schemes for the opening up of the country by railways and roads were excellent, if he had not run the state heavily into debt, and endeavoured to meet obligations by increased taxation. This led to his fall in 1895.

Tricycle. See CYCLE.

Tridacna. See CLAM.

Trident, a spear with three prongs, generally with pointed barbs, forming a characteristic emblem of Poseidon or Neptune, the sea-god. In Roman antiquities the trident is represented

as a three-pronged spear used by the *retarii* in gladiatorial combats.

Triennial Acts, acts providing for the meeting of a parliament at least once in three years. The first act was passed in 1641. This was broken by the Long Parliament, and was repealed in 1664. A second act came into operation in 1694; it was repealed by the Septennial Act of 1716.

Trient. See TRENT, Tyrol.

Trierarch, in ancient Greece, the commander of a trireme or war-galley. Among the Athenians this office was one of the burdens which fell upon the wealthier classes. The man selected for the office received the hull and part only of the rigging, with the pay and provisions of the crew; at his own expense he had to fit out the vessel, train the crew, and keep the whole ship in repair. After 405 B.C. the duty was divided between two citizens, and after 356 between several, owing to the decrease of wealth at Athens. No man was required to serve as trierarch oftener than once in two years.

Trieste, chief seap. (fortified) of Austria-Hungary, on gulf of same name, at N.E. of Adriatic Sea, 367 m. by rail s.s.w. of Vienna; forms a separate crown land (area, 36 sq. m.; pop. in 1900, 178,672), and also the seat of administration of the Austrian Coast Land, and the headquarters of Austrian Lloyd's. The old town, with narrow and steep streets, has many ancient buildings, such as the cathedral and the castle; the new town, Theresienstadt, has broad avenues and fine buildings, such as the new municipal buildings and the Tergesteo, which contains the exchange and reading rooms. The harbour is a fine one, and ships gain access to the city by the Maria Theresa Canal. Trade in grain, wine, and oil is considerable, more than half being with the Levant and the Far East. The total trade fluctuates in value between fifty and sixty millions sterling annually. Trieste is the naval arsenal and storehouse for the Austrian imperial navy. Shipbuilding is carried on, and marine steam-engines, anchors, ropes, soap, leather, and furniture are manufactured. In 1719 Trieste was made a free port by Charles VI.

Trifolium, a genus of hardy herbaceous plants belonging to the order Leguminosæ. They bear leaves of three leaflets, the stipules being adnate with the leaf-stalks. The flowers have calyxes with five unequal teeth, petals long-clawed and joined by their claws, stamens in two sets of nine and one. Among the

British species are *T. repens*, the white or Dutch clover; *T. pratense*, the purple clover; *T. ochroleucum*, the sulphur-coloured trefoil, a downy plant with creamy-yellow flowers, mostly occurring in the eastern counties of England; *T. medium*, the zigzag clover, a common pasture plant; *T. arvense*, the hare's-foot trefoil, with terminal, soft, downy, pinkish flower-heads, mostly occurring in sandy places near the sea; and *T. striatum*, the soft knotted trefoil, a very downy or silky plant, with light purple flower-heads, mostly occurring in dry places near the sea.

Triforium, the arcaded story between the top of the pier arches and the clerestory of a Gothic church. Behind it is usually a passage-way or ambulatory, frequently lighted by windows in the outer wall, especially in Romanesque work.

Triglyph. See ENTABLATURE.

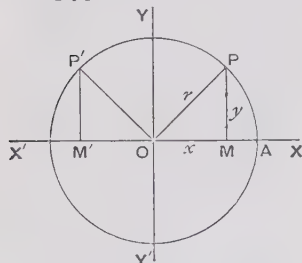


Diagram of Trigonometrical Ratios.

Trigonometry, strictly speaking, deals with the measurement of triangles, plane or spherical; but it also includes the theory of the trigonometrical functions or ratios of an angle. Draw two lines $X'OX$, $Y'OY$ at right angles, forming a system of rectangular arcs. Draw OP through O , making any given angle θ with OX . Let P be any point on OP , PM the perpendicular on OX . Let $OM = x$, $MP = y$, $OP = r$. The trigonometrical ratios of θ are (i.) cosine of θ ($\cos \theta$) = x/r ; (ii.) sine of θ ($\sin \theta$) = y/r ; (iii.) tangent of θ ($\tan \theta$) = y/x ; (iv.) secant of θ ($\sec \theta$) = r/x ; (v.) cotangent of θ ($\cot \theta$) = x/y ; (vi.) cosecant of θ ($\csc \theta$) = r/y . Clearly $\tan \theta = \frac{\sin \theta}{\cos \theta} = \frac{y}{x}$; $\sec \theta = \frac{r}{x}$; $\csc \theta = \frac{r}{y}$. Also $x^2 + y^2 = r^2$; $\therefore \cos^2 \theta + \sin^2 \theta = 1$.

There are two leading problems in trigonometry—the construction of trigonometrical tables for the values of the functions, and their application to measurements.

Tables.—In virtue of the formulae, $\sin (90^\circ - \theta) = \cos \theta$, $\cos (90^\circ - \theta) = \sin \theta$; $\sin (90^\circ + \theta) = \cos \theta$, $\cos (90^\circ + \theta) = -\sin \theta$; the tables need only be calculated for angles up to 45° . Thus $\cos 165^\circ = \cos (90^\circ + 75^\circ) = -\sin 75^\circ = -\cos 15^\circ$. When the functions for two angles a and b are known, those for the sum or difference are given by the addition theorem: $\cos (a \pm b) = \cos a \cos b \mp \sin a \sin b$; $\sin (a \pm b) = \sin a \cos b \pm \cos a \sin b$.

Tables for the sine and cosine might be calculated by means of the series

$$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \dots,$$

$$\cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \dots,$$

where x is the measure in radians of the angle θ ($\frac{\theta}{180^\circ} = \frac{x}{\pi}$). When

x is small, $\sin x = x - \frac{1}{6}x^3$, $\cos x = 1 - \frac{1}{2}x^2$, are sufficient approximations. Thus $\sin 1^\circ = \frac{\pi}{180^\circ} - \frac{1}{6}(\frac{\pi}{180^\circ})^3 = .0174$.

The addition theorem may then be used to complete the tables.

If a be the sine of an unknown angle, the angle is sometimes denoted by the *inverse function* $\sin^{-1}a$; similarly $\tan^{-1}\beta$, etc., so that an inverse trigonometrical function is always an angle.

Applications.—The elements of a triangle, plane or spherical, are the three angles and the three sides. In the plane triangle ABC , let a , b , c denote the sides; A , B , C the angles. Then

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}; \cos A = \frac{(b^2 + c^2 - a^2)}{2bc}, \text{ etc.}$$

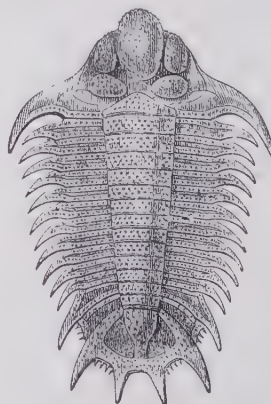
In the spherical triangle ABC $\sin A = \frac{\sin a}{\sin b \sin c}$; $\cos a = \cos b \cos c + \sin b \sin c \cos A$; $\cos A = -\cos B \cos C + \sin B \sin C \cos a$. In particular, when $A = 90^\circ$, $\cos a = \cos b \cos c$; $\cot B \cot C = \tan b \tan c$; $\tan b = \tan a \cos C$; $\tan c = \tan a \cos B$; $\cos b = \sin c \cos a$.

Trigonometry was originally a branch of astronomy, probably of Babylonian origin (Hipparchus, Menelaus). The *Almagest* of Ptolemy contains its first scientific exposition. In that work the circle is divided into 360 parts or degrees, each degree into sixty minutes, each minute into sixty seconds. The science had for object the measurement of a chord of a circle corresponding to a given angle, and Ptolemy made a table of these, obtained largely by the aid of Ptolemy's theorem. Plato of Tivoli first used the expression *sinus* for the

measurement of the half-chord—the modern sine. The sine of the complementary angle is the cosine (Gunter). The tangent was the special creation of the Arabs, while the secant was introduced by the astronomer Copernicus (Cantor). Regiomontanus first made trigonometry a separate science, independent of astronomy. At present trigonometry is a conglomerate, which borrows from synthetic geometry, analytical geometry, and algebra. The construction of trigonometrical tables has busied astronomers and mathematicians of all times. They are now usually incorporated in mathematical or logarithmic tables. See *Plane Trigonometry*, by Todhunter (1891); Hobson (1897); Pressland and Tweedie (1899); and *Spherical Trigonometry*, by M'Lelland (1885-6); and Preston and Casey (1889).

Trikkala (anc. *Trikka*), tn. and archiepiscopal see, cap. of prov. of same name, Thessaly, Greece, 36 m. w. of Larissa, is in a fruit-growing district, and trades in grain and tobacco. Cotton and woollen goods and leather are manufactured. It was once famous for its temple of *Æsculapius*. Pop. (1896) 21,149.

Trillium, a genus of hardy N. American herbaceous, perennial plants, belonging to the order Liliaceæ. They bear leaves in whorls of three, arranged at the apex of the stem, and solitary flowers with the three inner perianth segments petaloid, six stamens, and a trifold style. The most valuable species is the wake robin (*T. grandiflorum*), with white flowers in late spring. Trilliums thrive in a peaty soil.



Fossil Trilobite (*T. liches*).

Trilobites, group of fossil crustaceans, which occur in great numbers in the Cambrian and Silurian formations; a few survive into the Carboniferous, and

a single species is known from the Permian of N. America. The dorsal surface of their bodies was covered with a calcareous shell, which presented three longitudinal lobes, a mesial and two lateral, and was subdivided into three parts—viz. a head shield, a body shield or thoracic shield, and a tail shield or pygidium. The head was approximately semicircular, and had a central protuberance, the glabellum, and a flat border which formed the genæ or cheeks. The animal was able to roll itself up so that the soft lower surface of its body was protected. The anterior appendages were modified to form antennæ, mandibles, and maxillæ. See Salter's *British Trilobites* (1864-83).

Trilogy, a group of three dramas dealing with successive stages of the same subject, best exemplified by the ancient Greek dramatists. There was generally a fourth or minor piece, which took the form of a satiric drama. The most notable example was the *Æschylean trilogy*, the *Agamemnon*, *Choëphoræ* or *Electra*, and *Eumenides* or *Furies*. In modern times the two parts of *Henry IV.* and *Henry V.*, by Shakespeare; *Wallenstein* (comprising *The Piccolomini*, *Wallenstein's Camp*, and *Wallenstein's Death*), by Schiller; and *Chastelard*, *Bothwell*, and *Mary Stuart*, by Swinburne, are examples.

Trim, par. and co. tn., Meath, Ireland, on the Boyne, 30 m. N.W. of Dublin. It has many antiquities, and a monument to the Duke of Wellington, whose reputed birthplace, Dangan Castle, is 4 m. distant. The ruin of Bective Abbey, built before 1150, is near. Pop. (1901) 1,513.

Trimethylamine, $N(CH_3)_3$, a tertiary amine, that occurs in herring brine and the blossoms of hawthorn. It is chiefly obtained as a product of distillation of the vinasse or nitrogenous residue left in the preparation of sugar from beetroot. Trimethylamine is a gas with a fishy ammoniacal odour and strong alkaline reaction. When heated with hydrogen chloride, it yields methyl chloride, and is used as a source of that substance.

Trimmer, a short cross joist let in between two other joists to carry the ends of intermediate joists, to prevent them from entering a chimney or a window. See CARPENTRY.

Trimmer, a term applied to Charles Montague, Earl of Halifax, and other politicians, who, at the end of the 17th century, 'trimmed' their opinions, by steering a middle course between the tenets of the Whigs and the Tories. Halifax considered the title an honour.

(8)

Trimmer, SARAH (1741-1810), English authoress of children's books, was born at Ipswich. Among her publications are *Story of the Robins* (which first appeared as *Fabulous Histories*, 1786); *Easy Introduction to the Knowledge of Nature* (1782); and *The Economy of Charity* (1786). Mrs. Trimmer was a pioneer in the Sunday-school movement, and an authority on educational matters.

Trimurti, the Hindu trinity, is commonly represented by an equilateral triangle, or—as in the notable example at Elephanta, near Bombay—by three heads springing from one body; and is expressed in the mystic word AUM, each letter of which represents the co-equal persons of the godhead—Brahma, Vishnu, and Siva. This triad of modern Hin-

on the western side form, with the mainland of Venezuela, the Dragon's Mouth and the Serpent's Mouth, the two entrances to the Gulf of Paria. Orographically and geologically Trinidad is a part of S. America. The climate is hot but never oppressive. The annual rainfall is nearly 74 in. The chief products are cocoa, sugar, and asphalt, most of the last being obtained from La Brea lake, 60 m. s. of Port of Spain. Rum, Angostura bitters, and cocoa-nut oil are manufactured. Imports (1904-5), £2,629,050; exports, £2,479,270. Under the same administration (since 1889) is the island of Tobago (area, 114 sq. m.; pop. in 1901, 18,750), 20 m. to the N.E. The capital of Trinidad is Port of Spain, with a fine harbour. Scarborough is the port of Tobago. Trinidad was discovered



The Island of Trinidad.

duism was dimly foreshadowed in the *Vedas*.

Trinacria. See SICILY.

Trincomali, tn., on N.E. coast of Ceylon, has a magnificent natural harbour. It is a strongly fortified naval station. Here stood formerly the Temple of a Thousand Columns, visited by thousands of pilgrims; it was destroyed by the Portuguese nearly three centuries ago, but under the rule of the British the pilgrimages have been resumed. Pop. (1901) 13,000.

Tring, mrkt. tn., Hertfordshire, England, 7 m. S.E. of Aylesbury, and 32 m. N.W. of London. The Rothschild Museum (1889) contains library and fine natural history collections. Pop. (1901) 4,349.

Trinidad, (1.) Next to Jamaica the largest British island in the W. Indies. Two promontories

by Columbus in 1498, and was taken by the British in 1797. Area, 1,754 sq. m. Pop. (1901) 255,148, mostly coloured. (2.) Town, Cuba, on s. coast, was one of the earliest fortified cities of the New World, and the scene of desperate combats during the reign of the buccaneers. Sugar and honey are the chief exports. Pop. (1899) 24,271. (3.) City, Colorado, U.S.A., co. seat of Las Animas co., in a coal-mining region, 180 m. s. of Denver. Pop. (1900) 5,345.

Trinitarians, or REDEMPTIONISTS, a religious order established in France in 1198 for the purpose of ransoming Christian captives out of the hands of the Saracens. The order adopted a rule of life similar to the Augustinian, and wearing a red cross on a white robe, were known as

Red or Crutched (*i.e.* Crossed) Friars. There were several houses in England, Scotland, and Ireland at the reformation.

Trinity, a name applied to the Deity in virtue of its threefold personality: the one God is Father, Son, and Holy Spirit. Anticipations of the doctrine have been found in the Old Testament—*e.g.* the use of the plural *Elohim* (God) with a singular verb (Gen. 1:1), the Angel of Jehovah (Gen. 16:10), the Spirit of God (Isa. 48:16), and even, though unjustifiably, the threefold benediction (Num. 6:24-26), and the ascription of praise in Isa. 6:3. In the New Testament the baptismal charge (Matt. 28:19) and the apostolic benediction (2 Cor.-13:14) seem to premise the fact of the Trinity, but the 'three witnesses' of 1 John 5:7 are expunged by critics of the text. The New Testament, equally with the Old, assumes and asserts the unity of God, but the general attitude of the former towards Christ (*passim*) and the Spirit (*e.g.* John 14:16 f.; 15:26; 16:7-14) is one which entirely justifies the church in its trinitarian doctrine. Dogmatic theology draws a distinction between the economical and the essential Trinity—the divine in its various redemptive activities as contrasted with its inner metaphysical relations. It was only gradually, however, and by the pressure of heresy, that theologians formulated the doctrine. Gnosticism and Manichæism had a place for both Christ and the Spirit in their systems—one, however, subordinate to the Supreme; Monarchianism accepted a trinity of divine manifestations—the one God in three aspects; Arius regarded the Son and the Spirit as quasi-divine, pretemporal, yet created; in fact, these systems, advocating what looks like the economical Trinity, forced the Church to set up a doctrine of the immanent or essential Trinity, as correcting or supplementing the heretical views. Hence the Nicene (325 A.D.) and the Constantinopolitan (381) creeds respectively guard the essentially divine position of the Son and the Holy Spirit. In the 6th century the Western Church added the phrase *filioque* ('and from the Son') to the clause relating to the Spirit, thereby affirming the doctrine that the Spirit proceeds from the Son as well as from the Father—a step which led eventually to the schism of the Eastern or Greek Church. In modern times the Socinians, the semi-Arians of the 18th century, and, following these, the present-day Unitarians, may be said to have revived a developed and more scientific form of Arianism; while Sweden-

borg, making Christ the supreme Deity, runs on lines similar to Patripassianism. Such analogies of the Trinity as the threefold activity of the human spirit in intellect, emotion, and will, hardly carry us beyond the doctrine of Sabellius. See Dörner's *System of Christian Doctrine*, i. 344-365 (trans. 1888); short sketch in Moule's *Outlines* (1889), 19-30; from the Ritschlian standpoint, Kaftan's *Dogmatik* (1897), 189 ff.

Trinity House. There are Trinity Houses at Deptford, the Cinque Ports, Hull, Newcastle-on-Tyne, and Leith. They are the general pilotage authorities within their respective districts. The most important is the corporation of the Trinity House of Deptford, incorporated in 1514 by Henry VIII., which has jurisdiction over pilotage between Orfordness and the Isle of Wight, in the Thames and Medway as far as London and Rochester bridges respectively, and in all other districts within which there is no pilotage authority. It is also the general lighthouse authority for England and Wales, the Channel Islands, and adjacent seas and islands, and for Gibraltar, and has a controlling power with regard to schemes proposed by the Commissioners of Northern Light-houses and the Commissioners of Irish Lights, though it is to a certain extent under the control of the Board of Trade. The Elder Brethren of the corporation (or Trinity Masters), as nautical assessors, assist the judges of the Admiralty Division, and other judges if required, in shipping cases. See Mayo's *The Trinity House, London* (1905).

Trinity Sunday, the octave of Pentecost, a feast of very early institution. The name Trinity Sunday is found in the English breviary and missal since the time of St. Oswald.

Trinobantes, an ancient British tribe which inhabited the modern counties of Essex and Suffolk; their capital was Camalodunum (Colchester). They submitted to Caesar in 55 B.C., but in 61 A.D. joined the revolt of the Iceni under Boadicea, and were subdued by Suetonius Paulinus.

Trinoda Necessitas, three imposts or taxes to which all lands (including church lands) were subject in Anglo-Saxon times: (1) *bruge-bôt*, for keeping bridges and highways in repair; (2) *burg-bôt*, for maintaining the burghs or fortresses in good order; and (3) *fyrd*, for the support of the naval and military forces of the kingdom.

Trio, in music, a composition for three voices or instruments. The most important form of in-

strumental trio is that for violin, cello, and piano. The term is also used as the title of a subsidiary movement in 3 time, which is introduced into certain forms of composition.

Tripe consists of the paunch or first part of the bovine stomach. The involuntary muscle it contains is easy of digestion, but from the large quantity of fat present in its tissues tripe is unsuitable for delicate stomachs.

Tripe de Roche, an edible lichen, *Gyrophora cylindrica*, a native of Arctic America.

Tripitaka, a name occasionally used for the Chinese *San-tsang*, translations of ancient Sanskrit texts, a complete copy of which, in 2,200 volumes, is in the India Office, while another edition in 500 volumes was issued at Tokyo (1881-85), but more properly belonging to the sacred writings of the Buddhists. See PITAKA.

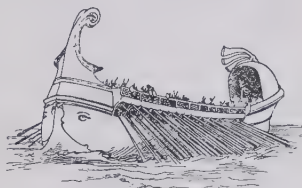
Triple Alliances. The first famous triple alliance was concluded in 1668 between England, Holland, and Sweden in order to check the aggressive policy of Louis XIV., who had overrun the Spanish Netherlands. In 1717 England, France, and Holland made an alliance which tended to the preservation of the peace of Europe for many years. The object of the Regent Orleans was to secure an ally against Spanish hostility; that of George I. was to secure the expulsion of the Jacobites from France. In 1788 England, Prussia, and Holland allied, and for some four years this triple alliance to a great extent gave the law to Europe. It owed its existence to the sagacity of William Pitt. In 1872 Russia, Austria, and Germany united in the League of the Three Emperors. Its conclusion was due to Bismarck's anxiety to preserve the peace of Europe. In 1883 Italy joined Germany and Austria, which had allied in 1879. The object of this triple alliance was the maintenance of peace.

Tripoli, cap. of vilayet of Beirut, Syria, 40 m. N.N.E. of Beirut, and 2½ m. from its port, El Mina; has overland trade with Aleppo, and exports silk, grain, wool, fruit (oranges and lemons), sponges, and ostrich feathers. Its foreign trade is valued at about £1,000,000. The old town was an important port in Phœnician times. There is a castle. Pop. (including El Mina) 30,000.

Tripoli, a Turkish possession, which stretches 1,000 miles along the N. coast of Africa between Tunis and Egypt. Its hinterland takes in Fezzan, and extends inland for about 800 m. The area (including Barca, or Benghazi) is estimated at 400,000 sq. m., and the pop. at from 1,000,000 to 1,500,000. The productive ground

is nearly all situated on the coastal plain. Tripoli, away from the coast, is regular Sahara country, notably round the Gulf of Sidra—sandy ground, strewn with boulders, with sparse vegetation, mostly of thorny bushes, and occasional wadies. Barca, however, is a prolongation of the mountain system of Algeria and Tunis. Fat-tailed sheep are plentiful. Barley, the staple food of the people, is the most important crop. Others are wheat, dates, olives, oranges, lemons, madder, and beans—all (except wheat) exported. Other exports are esparto grass, cattle, eggs, wool, skins, and hides. The imports for 1904 amounted to

to the s. Murzuk, on an oasis in Fezzan, is a junction for caravan routes from Ghat to Zella and



Roman Trireme.

Augila. See *À travers la Tripolitaine*, by Mathuisieulx (1903).

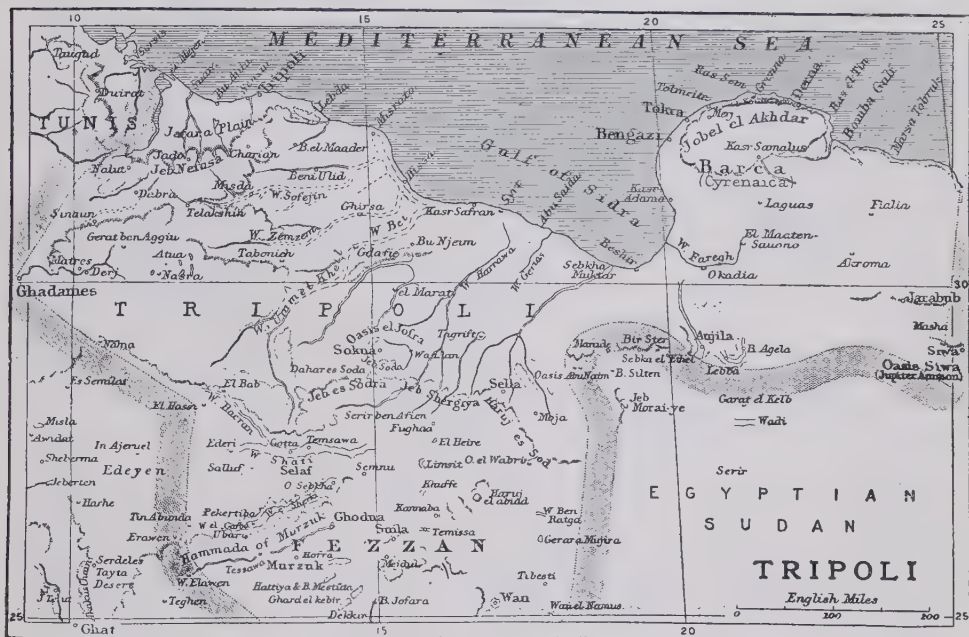
Tripoli Powder. See KIESEL-GUHR.

languages, and economics and political science.

Triptolemus, in Greek legend, was the son of Celeus, king of Eleusis in Attica, who was taught the secrets of agriculture by Demeter. He afterwards instituted the Eleusinian mysteries in her honour.

Triptych, originally a writing tablet of three leaves. The term is also applied to a work of art, either pictorial or wood-carving, which consists of three panels in juxtaposition.

Trireme, a ship used in ancient navies. It was propelled mainly by oars (though it had a mast and sails), and the oars were arranged in three banks or tiers,



£361,300, and the exports to £386,500. There is a dwindling caravan trade across the desert, in ivory, gold-dust, and feathers, with Kano and Wadai. The whole country in the vicinity of the coast is covered with Roman remains. The people are of Berber stock, with a considerable admixture of Jew and negro elements. Three cities were founded here by the Phoenicians—Sabrata (Zuara), Leptis (Lebda), and Ea (Tripoli). Tripoli is the capital, with 30,000 inhabitants; it possesses an open harbour. Benghazi (15,000) is the capital of Barca. The oasis of Ghadames, 320 m. s.w. of Tripoli, is a favourite halting place for caravans, as is the oasis of Ghat, 360 m. farther

Tripolitza, or **TRIPOLIS**, t.n., cap. of nomarchy of Arcadia, Greece, 40 m. s.w. of Corinth; has manufactures of tapestries and leather goods. It was the capital of the Morea under the Turks. Pop. (1896) 10,465.

Tripos, the name applied to the final examination for honours in Cambridge University. The examination is held at the end of May or beginning of June, and the examinees must have completed at least nine terms of actual residence. There are various kinds of tripos—mathematical (in which the candidate who is first is senior wrangler), classical, history, theology, moral science, mechanical science, natural science, Oriental languages, mediæval and modern

one above another. The exact arrangement of these banks is matter of acute controversy, though the oars of the highest bank must have been considerably longer than those of the lowest. Triremes were invented in Phœnicia; they were introduced into Greece probably in the 6th century B.C. They were long and narrow, and were the regular warships until about 350 B.C.; when they were superseded by quadriremes and quinqueremes. The crew of an Athenian trireme consisted of 170 rowers, 20 other men to manage the ship, and 10 marines; they fought entirely by ramming. See C. Torr's *Ancient Ships* (1894) and Kopecky's *Die attischen Trieren* (1890).

Trisagion ('thrice holy'), the 'tersanctus,' in use in the office of holy communion just before the prayer of humble access which precedes the consecration of the elements.

Trismegistus. See THOTH and HERMETIC BOOKS.

Trissino, GIAN GIORGIO (1478-1550), Italian poet, was born at Vicenza. Towards the end of his life he lived mostly near Venice or at Rome. His most important work is the tragedy *Sofonisba* (1524; ed. by Pagliarani, with Tasso's notes, 1884; cf. monograph by Ciampolini, 2nd ed. 1896), remarkable as the first modern tragedy composed according to Aristotle's rules. The metre, blank verse of eleven syllables, was also a novelty for a work of this length. The comedy, *I Simillimi*, was imitated from Plautus (1547). The epic, *Italia Liberata dai Goti* (1547-8; monographs by Ciampolini, 1881, and by Ermini, 1893), deals with the deeds of Belisarius, and is a poor imitation of the *Iliad*. Trissino's lyrics and a *Poetics* show greater gifts. A complete edition of his works was published by S. Maffei (1729). See monographs by Castelli (1753) and Morsolin (2nd. ed. 1894).

Tristan, nephew of King Mark of Cornwall, lover of his uncle's wife Isolt, in later versions a knight of King Arthur's court. The legend is a blending of elements derived from widely differing sources—Celtic, Scandinavian, classic, and French. Professor Zimmer believes that the central motif of the tale faithfully reflects the historic conditions prevailing in the 9th century between Ireland and Great Britain. Professor Golther, on the other hand, denies any important Celtic or insular element in the story; and M. Gaston Paris, while emphasizing the Celtic character which, he holds, stamps the legend throughout, only accepts Professor Zimmer's theory with reserve. The following points, however, are generally admitted. The Tristan versions fall into two distinct groups. In the one group Tristan is connected with the Arthurian cycle. The other group is represented exclusively by the poem of Thomas of Brittany, an Anglo-Norman, and his translators, Gottfried von Strassburg, and the author of the English *Sir Tristram* and the northern *Tristram Saga*. In this French original the story knows nothing of Arthur and his court. The poem of Gottfried von Strassburg is beyond question the finest of the Tristan romances. Interest in the legend has been reawakened by Richard Wagner's great music drama *Tristan and Isolde*, based upon Gottfried's poem; this, and

Swinburne's *Tristram of Lyonesse*, are the best modern renderings of the famous tale. See Tennyson's *The Last Tournament*; Arnold's *Tristram and Isolt*; J. Bédier's *Le Tristan de Thomas* (1900); M. Gaston Paris's *Tristan et Isolt* (1900); W. Golther's *Die Sage von Tristan und Isolde* (1887); Zimmer's *Zur Namenforschung in den altfranz. Arthur-epen* (1890); W. Roetiger's *Der heutige stand der Tristan Forschung* (1897).

Tristan da Cunha, group of volcanic islands (Tristan, Gough's, Inaccessible, and Nightingale), in S. Atlantic, 37° 6' S. and 12° 1' W. Tristan was discovered by the Portuguese in 1506, and was taken by the British in 1816. On it is the Edinburgh settlement, formed in 1821. Pop. (1903) 76.

Tristram. See TRISTAN.

Triticum, a genus of hardy grasses, mostly natives of the south of Europe and the west of Asia. They bear flat leaves and terminal cylindrical spikes of from two to five flowered spikelets. Much the most important species is *T. vulgare*, wheat.

Triton, in ancient Greek mythology, a son of Poseidon and Amphitrite, who dwelt in a golden palace at the bottom of the sea. This is Hesiod's account; later writers speak of tritons in the plural, and sometimes as human above the waist and fish-like below. In poetry and art they are distinguished by trumpets, which they blow to calm the stormy waves.

Triton, a name sometimes given to the newt; and also used for a genus of gasteropods with large handsome shells, most of whose members are found in warm seas. The shell of one species, *T. tritonis*, is used as a war trumpet by the South Sea Islanders.

Tritonia, a genus of South African bulbous plants belonging to the order Iridaceæ. They have linear leaves, and more or less tubular or campanulate flowers. They do well in moderately rich, light, well-drained soil. Among the species are the garden plants known as montbretias. Most of the species require cool greenhouse treatment.

Triumph, the celebration at Rome of a victory by a successful general. It was granted by the senate, and on the day of the celebration all temples were open, all shrines garlanded, and every altar burnt incense. The general, drawn in a chariot by four horses, wearing a *toga picta* and a *tunica palmata*, with laurel on his brow, a bough of the same in his right hand, and a sceptre in his left, accompanied by his friends, and attended by a slave holding over his head a golden crown, was met

by the senate and magistrates at the triumphal gate. There a procession was formed, which included the principal captives of the enemy, the victorious general and his whole army, now singing hymns to the gods, now breaking into coarse satire on their leader—a freedom allowed to avert divine jealousy. The sacrificial victims (oxen) were offered in the temple of Capitoline Jupiter, the goal of the procession, and the victor's laurel wreath was offered to the god. In the evening the conqueror was entertained at a public feast. Besides, he was regularly presented with a site for a house, and at his death his ashes were buried within the city. After 14 B.C. the emperor ceased to allow triumphs to any generals except members of the imperial house.

Triumph, a British first-class battleship (11,800 tons), launched Jan. 15, 1903. This vessel was built for the Chilean government, and bought by Great Britain. The name was introduced into the navy in 1561.

Triumvir, the designation at ancient Rome of officials who belonged to various boards of three members. Of the two famous triumvirates, the first was a mere private compact between Julius Cæsar, Pompey, and Crassus in 59 B.C., and had no constitutional basis; the second, formed in 43 B.C. between Octavian (Augustus), Antony, and Lepidus, was formally established by decree of the people 'to settle the constitution'; the powers were granted for a period of five years, and renewed in 38 B.C. for five years more.

Trivandrum, tn., cap. of Travancore state, Madras Presidency, India, 50 m. N.W. of Cape Comorin. Besides the palaces of the maharajah, there are a large temple of Vishnu, a mint, and the maharajah's college. There are military cantonments N. of the town. Pop. (1901) 57,882.

Tirnov. See TIRNOVO.

Troas. See TROY.

Trocar, a surgical instrument, consisting of a steel stylet, one end of which is sharpened to a point on three sides or faces, while the other end is fixed to a handle. A movable cannula or metal tube is closely fitted round the stem of the stylet. The instrument is of great use in withdrawing fluids from enclosed spaces. After being plunged into the cyst, the stylet is withdrawn from the cannula, through which the fluid is allowed to escape.

Trochee, a metrical foot consisting of two syllables, the first long, the second short (—v); or, in the accentual system of English, the first accented, the second unaccented. The best ex-

ample in English of a poem of any length written in trochees is longfellow's *Hiawatha*.

Trochidae. See TOP-SHELL.

Trochilidae. See HUMMING-BIRDS.

Trochilus. See HUMMING-BIRDS.

Trochu, LOUIS JULES (1815-96), French general, born at Le Palais, near Belle-Ile-en-Mer; served in Algeria and at the Crimea, also in the Lombardy campaign of 1859. The undertaking, however, which brought him most into prominence was his defence of Paris in 1870, when besieged by the Germans.

of Egypt and Ethiopia, but especially to those on the Red Sea coasts. They are described as inhabiting caves, and living almost solely on animal food. They were chiefly herdsmen.

Trogon. See QUEZAL.

Troilus, in ancient Greek legend, a son of Priam, king of Troy, and Hecuba; he was killed by Achilles. The story of his love for Cressida, daughter of the Trojan high priest Calchas, which is the subject of Shakespeare's *Troilus and Cressida*, is not found in the ancient classical writers, but is derived from mediæval romances on the tale of Troy.

country. The remarkable success of this attempt encouraged the authoress to publish a series of novels.—**ADOLPHUS TROLLOPE** (1810-92), son of the above, was a novelist and historian. To him we owe *Girlhood of Catherine de' Medici*, *A Decade of Italian Women*, and *A History of Florence*. His wife, Frances Eleanor Trollope, was also a novelist.—**ANTHONY TROLLOPE** (1815-82), the most famous of the family, was born in London, and entered (1834) the post office as clerk. Seven years afterwards he became post office surveyor in Ireland. His first literary efforts,



Trollhätta Fall, Gothenburg, Sweden.

Troctolite, a granitoid, crystalline, plutonic igneous rock, consisting of olivine and basic plagioclase feldspar. It usually accompanies gabbro and serpentine, as in Scotland, Cornwall, and Saxony.

Trezen, tn. in Argolis in ancient Greece; was probably subject at first to Argos, and then to Sparta, except from 459 to 445 B.C., when it was held by Athens. It was afterwards subject to Macedonia, until it joined the Achæan League, about 230 B.C.

Troglodytes, or CAVE DWELLERS, a name applied to certain ancient tribes in Mauritania, N. Africa, the Arabian coast of the Red Sea, and the opposite coasts

Troitsk, tn., Orenburg gov., E. Russia, 310 m. N.E. of Orenburg city. Its manufactures comprise firearms, iron works, tanneries and tallow foundries. There are gold mines in neighbourhood. Pop. (1901) 23,293.

Trollhätta, waterfall (100 ft.) in Göta riv., S. Sweden; drives industrial establishments. A canal (1844) leads round the falls.

Trollius. See GLOBE FLOWER.

Trollope, FAMILY OF.—**FRANCES TROLLOPE** (1780-1863), was born at Stapleton, near Bristol. She married in 1809 Thomas Trollope, with whom she went to Cincinnati. Her *Domestic Manners of the Americans* (1832) was the result of four years' residence in that

including *The Kellys and the O'Kellys* (1848), met with no success, and it was not till the publication of *The Warden* in 1855 that he received any encouragement. Among his other novels are *Barchester Towers* (1857), *Orley Farm* (1862), *Framley Parsonage* (1861), and *Can You Forgive Her?* (1855). See his *Autobiography* (1883).

Trolls, in the traditional and semi-historical literature of Scandinavia, a species of mythical aborigines, who were eventually regarded as demons or semi-demons. The name was by analogy extended to the natives of Greenland by the early Norse visitors to that country.

Trombone, a musical wind instrument, the most important of the trumpet family. It is constructed of sections of brass tube so connected that they form two long loops, the three tubes of which lie parallel to one another.



Trombone.

With the exception of its curve, the loop from a little below the mouth-piece is constructed of *double* cylindrical tubes, the outer sliding upon the inner. The lower ends of the outer tubes terminate in the curved section forming the bottom of the loop, and their

ZOON TROMP (1597-1653), was born at Briel, and in 1639 defeated a Spanish fleet in the Downs. In the first Dutch war with England he commanded at the battles of Dover and Dungeness in 1652; and at those of Portland, the N. Foreland, and Scheveningen, in 1653. At the last of these he fell. His second son, CORNELIS TROMP (1629-91), was born at Rotterdam, and served against the English in the Mediterranean in 1652 and 1653. In the second Dutch war with England he behaved with bravery at Solebay and off the Dunes, but in consequence of De Ruyter's complaints about his disobedience he was deprived of his command. In the third war with England he dis-

suspended the town scales for weighing wool and other commodities. From this is derived the phrase *tron weight*, a standard of weight formerly in use in Scotland for wool, cheese, and butter, the pound ranging in various counties from 21 to 28 ounces.

Trona, a variety of sodium sesqui-carbonate, $\text{HNa}_3(\text{CO}_3)_2 \cdot 2\text{H}_2\text{O}$, that occurs naturally and is found principally in N. Africa.

Trondhjem, THRONDHJEM, or DRONTHEIM, city, cap. of co. of same name, Norway, on s. side of Trondhjem Fiord, 350 m. by rail N. of Christiania. In the harbour stands the prison-fortress of Monkholm, and on a height near the town Christian-



Trondhjem.

(Photo by Valentine.)

upper ends are connected by a transverse bar, to which, in the bass trombone, a jointed handle is attached. By means of the bar, the player, while holding the mouth-piece against his lips with one hand, can at will increase the normal length of the column of air to nearly double the length of the original loop. With this instrument a chromatic compass of about two and a half octaves may be obtained. A system of valve mechanism instead of the slide is sometimes used, but though easier to play, the tone of the instrument is less rich.

Tromp, several Dutch naval captains. MARTIN HARPERTS-

tinguished himself in the battles off Schooneveld (1673). After the peace he visited England in 1675, and was made a baronet by Charles II. There seems to be no foundation for the old fable that the elder Tromp cruised in the Channel with a broom at his mast-head in token of his contempt for his English opponents.

Tromsø, tn., cap. of co. of same name, Norway, on island of Tromsø; is the seat of a bishop, and has a trade in fish and train-oil. Pop. (1900) 6,955.

Tron, or TRONE, a wooden pillar or post erected in a marketplace, and giving support to a horizontal beam, from which were

sen castle. The Anglo-Norman cathedral of St. Olaf, the most interesting ecclesiastical edifice of Norway, dates from the 13th century, but all that remains of the original building (since the fire of 1530) is the richly adorned Late Gothic choir. The work of restoration was begun in 1861. The chief exports are copper, herrings, blubber, timber, and cellulose. Trondhjem is the seat of a bishop, and has an Academy of Sciences. The city, originally called Nidaros, was founded in 997 by Olaf Tryggvason, and was formerly the capital of Norway. It was in the middle ages a pilgrim resort (shrine of St. Olaf),

and is now the crowning-place of the kings of Norway. King Haakon VII. and his queen were crowned here in 1906. Pop. (1900) 38,156.

Troon, seapt. tn., Ayrshire, Scotland, 6 m. N.W. of Ayr, has a good harbour, protected by a breakwater, also two dry docks, a shipbuilding yard, and engineering works. Coal is shipped. Pop. (1901) 4,764.

Tropial. See **TROUPIAL**.

Tropaeolum, a genus of herbaceous plants belonging to the order Geraniaceæ. They usually twine or trail, and for the most part bear lightly-coloured red, orange, or yellow irregular flowers, followed by wrinkled, hard, iridescent, one-seeded fruits. The tuberous-rooted species are best grown in pots, containing a mixture of peat, fibrous loam, and sand, in a cool glass-house. *T. spectosum*, the flame-flowered nasturtium, requires a moist, shady position, and absolute freedom from root disturbance. *T. minus*, the small nasturtium or Indian cress; *T. peregrinum*, the Canary creeper; and *T. majus*, the great nasturtium, are all hardy annuals easily raised from seed sown in spring; whilst *T. polyphyllum*, the yellow rock Indian cress, is a hardy perennial of the greenhouse species.

Trophy, consisted usually of the weapons, shields, and helmets of the vanquished foe, attached to the trunk of a tree, and were dedicated to a god, generally Zeus. The trophies for naval victories were placed on the nearest coast, and were usually adorned with the beaks of ships. The Romans did not adopt the Greek custom of erecting a trophy until 121 B.C.; and in most cases the trophy was erected at Rome—e.g. the *rostra*, or beaks of captured war-vessels, in the Forum and the column of Trajan.

Trophy-money, money formerly collected in the English counties for providing horses and ammunition for the militia under the Act of 1662. It is still raised in the city of London by the commissioners of lieutenancy for their expenses.

Tropic-bird (*Phaethon*), a genus of tropical oceanic birds nearly allied to the solan-geese and cormorant. Their flight is rapid, and they often follow ships at sea, being called boat-swain birds by sailors. Their food consists chiefly of fish and cuttles. The single egg is laid in a crevice of rock. The plumage is shining white, sometimes with a tinge of pink, and with black marks and streaks, especially on the head.

Tropics, the term geographically applied to the regions of the globe lying between the two

parallels of latitude which mark the N. and S. limit of the sun's verticality to the earth's surface, namely, the tropic of Cancer, nearly 23½° N., and the tropic of Capricorn, nearly 23½° S. of the equator. Being the hottest portion of the earth's surface, this belt is known as the Torrid Zone, and has a characteristically luxuriant vegetation.

Troppau, tn., cap. of Austrian Silesia, 40 m. N.E. of Olmütz. It has the Liechtenstein palace. Sugar, cloth, jute, and bricks are manufactured, and spirits distilled. Pop. (1900) 26,725.

Trossachs, romantic, wooded glen (1 m. in length), immortalized in Scott's *Lady of the Lake*, Perthshire, Scotland, between Loch Achray on the E. and Loch Katrine on the W., 8 m. S.W. of Callander. Ben A'an rises on the N.E., and Ben Venue on the S.W.



Trotting Horse.

Trotting, a form of racing almost confined to the United States and Canada. All thoroughbred trotters trace their pedigree to a horse named 'Messenger,' imported in 1788 into Philadelphia from England. The first recorded trotting race was held in America in 1818; the distance was a mile, and was covered in three minutes. The National Trotting Association, founded in 1869, now regulates trotting on the principal tracks. Great care is devoted to the preparation and perfecting of the tracks. The surface must be as smooth as a billiard table, and kept so by continual rolling. Most tracks are of an oval shape, with long straight stretches and easy curves. The length is either one mile or half a mile exactly. Prices have risen each year for good trotting horses. In 1876 the record price for two two-year-old fillies was £2,600, and at the same time a three-year-old colt fetched £2000. Nowadays these prices are not considered at all high. The method adopted by some of the best trainers is to put the young colt into a skeleton wagon, so that no weight is on his back until he has been properly gaited. If the stride is long and the colt has good knee action, he promises well. If his stride is long, but he fails to gather well, heavier shoes are put on his front feet, or weight boots of from one to

two pounds are used. If he has not sufficient action behind, lead rollers weighing about one pound each, covered with leather, are buckled on above the pastern joint of the hind legs. In racing the driver must weigh 150 lbs. with the blanket on which he sits. Sulkies generally weigh about 40 lbs. See J. Splan's *Life with the Trotters* (1889), and H. J. Helm's *American Roadsters and Trotting Horses* (1878).

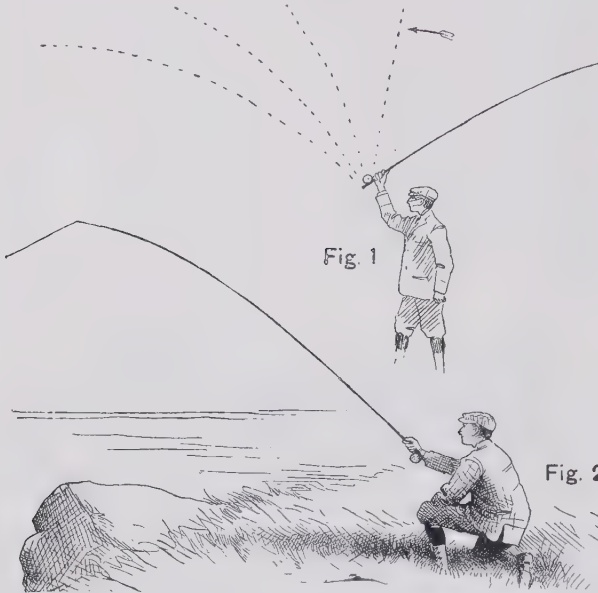
Troubadours, the mediæval poets of Southern France who flourished from the beginning of the 12th to the end of the 14th century, court poets, singers of war and of love, whose wandering lives, full of passion and adventure, have made them the typical romantic figures of their age. Among their chief patrons were the counts of Provence, the counts of Toulouse, and several kings of Aragon and Castile. In Italy, the lords of Este and the Emperor Frederick II. welcomed the singers of Languedoc to their courts. A troubadour frequently lingered for several years at the court of some patron, singing the praises of the mistress of the mansion. Their songs divide themselves into two classes, *chanzos* and *sirrentes*. The object of the former was gallantry; of the latter, war, politics, or satire. The troubadour was rewarded with gifts of money, weapons, horses, or garments. Each troubadour learned from his predecessors, and handed down the traditions to the next generation. It is astonishing to observe what very slight traces of learning the poetry of the troubadours displays. Though he certainly was not the creator of the lyric poetry of southern France, William IX., Count of Poitou and Duke of Aquitaine, by personally cultivating it, gave it a position of honour. His works were collected by M. de la Curne de Sainte-Palaye. His daughter Eleanor, queen of Louis VII. of France, and afterwards of Henry Plantagenet of England, was the subject of the impassioned songs of Bernard de Ventadour. Sordello of Mantua, Arnaud de Marveil, Arnaud Daniel, Rambaud de Vaqueiras, Pierre Vidal of Toulouse, are among the most celebrated of the troubadours. See **PROVENÇAL LANGUAGE AND LITERATURE**, **JONGLEURS**; also Smith's *The Troubadours at Home* (1899), Hueffer's *The Troubadours* (1878), Chabaneau's *Les Biographies des Troubadours* (1885), and Farnell's *Lives of the Troubadours* (1896).

Troubridge, SIR THOMAS (1758?-1807), British rear-admiral, born in London; first distinguished himself at the capture

of the *Sartine*. In 1783 he took part in the second action off Cuddalore, India. In 1794 he was captured by the French; but after being released, he shared in Hotham's action off Hyères, led the British fleet at Cape St. Vincent, and distinguished him-

of the bird family Icteridæ (hanging-nests, cassiques), or more particularly to the members of the genus *Quiscalus*, which are also known as crow-blackbirds and boat-tails. An example is *Q. purpureus* of the Atlantic states of N. America.

pale circle, below the lateral line, and ten red spots on the lateral line; but the spots are variable. The common trout is found in most of the rivers and lakes of northern Europe. In lowland streams its average weight reaches from half to three-quarters of a pound, but in deeper water specimens have been taken of more than fourteen pounds in weight. The flesh varies from pink to white. The common trout, though bold and voracious, is very shy, cautious, and cunning, and its capture demands skill and patience on the part of the angler; a favourite haunt is often behind a stone or bank, or under the shadow of a bush. It feeds upon small crustaceans (*Gammarus*), molluscs, insects and their larvæ, especially caddis-flies, and small fishes (e.g. salmon fry and minnows); but snails, slugs, worms, leeches, frogs, and even water-rats and young birds, have been found in its stomach. The common trout spawns generally at the end of October and in November; but the period may extend to February or March, or even later. The number of eggs is approximately about 800

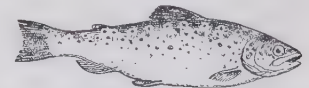


Trout-fishing.

Fig. 1. An ordinary cast. Fig. 2. Casting with care the 'dry fly.'

self in Nelson's attack upon Santa Cruz. At the battle of the Nile, his ship grounded as he went into Aboukir Bay, and he was thus prevented from taking part in the action. He afterwards did good service on the Italian coast, and in 1799 was made a baronet. In the same year he commanded for a time

Trout belong to the same genus of fishes as the salmon. The name is applied to several species, both migratory—as the sea trout and salmon trout—and non-migratory. Of the latter the common trout, brook trout, or river trout (*Salmo fario*) is extremely variable; in Scotland almost every lake, river, and

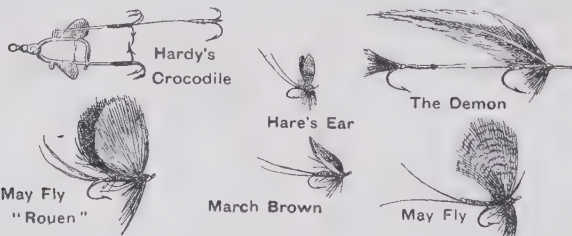


Common Trout.

for each pound weight, and they are deposited in 'redds' in the shallow parts of running streams, the eggs lying loose under a mound of gravel; at 44° F. they take about seventy-one days to hatch. Individuals have been known to live for thirty or even fifty years. Trout are now artificially propagated on a large scale for stocking waters. See PISCICULTURE.

The Loch Leven trout (*S. levenensis*) is highly esteemed both for its red flesh and its peculiar delicacy of flavour. It is found not only in the historic Kinross-shire loch, but also in other lochs in the south of Scotland and the north of England.

The 'gillaroo' trout (*S. stomachicus*) is perhaps only a variety of the common trout. It is found in Loughs Corrib, Derg, Neagh, and other Irish lakes, and attains a large size. The great lake trout (*S. ferox*) is found in the Highlands of Scotland, in Lochs Shin, Assynt, Laggan, Awe, and in many of the Irish lakes. It is a strong, active, predaceous fish, with red flesh, and attains a large size, up to twenty pounds. It is generally deep purplish brown above, and grayish yellow below, with large and comparatively few spots, and is distinguished from the com-



Trout Flies and Lures.

the blockading squadron at Alexandria, and in 1800 succeeded Nelson off Malta. In 1804 he was promoted to flag-rank. He was lost with all hands in the *Blenheim*, in a gale in February 1807.

Troupial, or **TROOPIAL**, a name applied generally to the members

streamlet possesses a breed peculiar in outward appearance to itself. The colour of the back is generally dusky or slightly olive, the belly yellowish or silvery, and there are about fifty dark round spots above the lateral line, about ten, surrounded by a

mon trout by the position of the fins and the longer snout. It is chiefly caught by trolling, though sometimes with the fly.

Other British trout are the black-finned (*S. nigripinnis*) and the Loch Stennis trout (*S. oreadensis*); other forms have been introduced, as the rainbow trout (*S. irideus*) from the United States. This species, as well as the common British trout, has been introduced to Tasmania, Australia, and the Cape of Good Hope. See Houghton's *British Fresh-water Fishes* (1879), and Hodgson's *Trout Fishing* (1904); also ANGLING.

Trouvère, the northern French term corresponding to the Provençal troubadour, and applied generally to the poets who composed the *chansons* performed by the jongleurs. The line of distinction between *trouvère* and *jongleur* is, however, not definite, though the *trouvère* was generally a man of some rank and position.

Trouville, seaside resort, dep. Calvados, France, on the bay of the Seine, 9 m. s. of Le Havre; has boat-building and fishing. Its port is shared by Deauville to the s.w. Pop. (1901) 6,137.

Trover, a form of action in England for the recovery of goods wrongfully converted by another to his own use. It is sufficient for the owner to prove that another person has his goods, and has refused on request to deliver them up. Trover is now generally called wrongful conversion.

Trowbridge, tn., Wilts, England, 11 m. s.e. of Bath. Broad-cloths and kerseymeres have been manufactured here since the 16th century, and iron-founding and brewing are carried on. Pop. (1901) 11,526.

Troy, the name usually employed to denote both the country (Troas or Troas) and the chief city (Ilios, Ilion, or Ilium) of the people known as Trojans. Dardanus was regarded as the founder of the royal line; Greek tradition represented him as an immigrant from Arcadia, who succeeded the local king, Teucer. Anyway, Trojan civilization was certainly identical with the contemporary Greek civilization (the Mycenaean). The period of Troy's greatness—say two hundred years—fairly corresponds with that suggested by the archaeological evidence. The famous siege lasted for ten years, and was due to the rape of Helen by Paris. One stage of the siege is sung of in Homer's *Iliad*; the cyclic poets told what preceded and succeeded the *Iliad*. Thirty years ago the tale of 'Troy divine' was mostly regarded as mere legend; that it now ranks once more as history, in its main outlines, is entirely

due to Schliemann, who explored (1870 to 1890) the site of Troy. That site was on a mound called Hissarlik, near the shores of the Aegean and the Hellespont. Schliemann's excavations were continued by Dörpfeld in 1893 and 1894, and this work throws quite a new light on Schliemann's discoveries. The mound of Hissarlik is distant $3\frac{1}{2}$ m. from the Aegean, and $3\frac{1}{2}$ m. from the Hellespont. The rivers of Homer—the Scamander (now the Mendere) and the Simois (the Dumbrek-su)—have both been identified, and their courses exactly correspond with the Homeric description. On the site of the Hissarlik mound the following successive settlements have been traced and determined:—(1.) An early settlement with a wall built of small stones and clay. The implements found are mostly of stone; the pottery is primitive. Its date was perhaps 3000 to 2560 B.C. (2.) A prehistoric fortress, with strong ramparts and large houses, built of bricks; it had been three times destroyed and rebuilt. Its pottery was of the kind called monochrome, and many objects of gold, silver, and bronze were discovered in it. It dated from 2500 to 2000 B.C. (3.) (4.) (5.) Prehistoric settlements, villages rather than towns, which were successively built on the debris of (2). Their houses were of small stones and sun-dried bricks; the pottery was like that of the previous settlement, but scarce. These settlements may have covered the period from 2000 to 1500 B.C. (6.) A Mycenaean fortress, including a larger area than any of the preceding settlements, with huge walls, towers, and houses of wrought stones. Its pottery is of the developed monochrome order, with Mycenaean imported vases. Its date may be placed at from 1500 to 1200 B.C. or later. (7.) (8.) Greek settlements, again of the character of villages; their houses are of a simple kind, built of stone; they contain both monochrome ware and also nearly all known kinds of Greek pottery. They cover the period from 1000 B.C. or so to the 1st century B.C. (9.) The acropolis of the Graeco-Roman town of New Ilion, which possessed a famous temple of Athena, and magnificent buildings of marble; Roman pottery and inscriptions are found. This city existed from the 1st century B.C. to 500 A.D. Of these various settlements Schliemann had not really discovered more than the first five. It was the second settlement which he identified with the Homeric Troy; Dörpfeld's discoveries now make it certain that the identification must be made with the sixth.

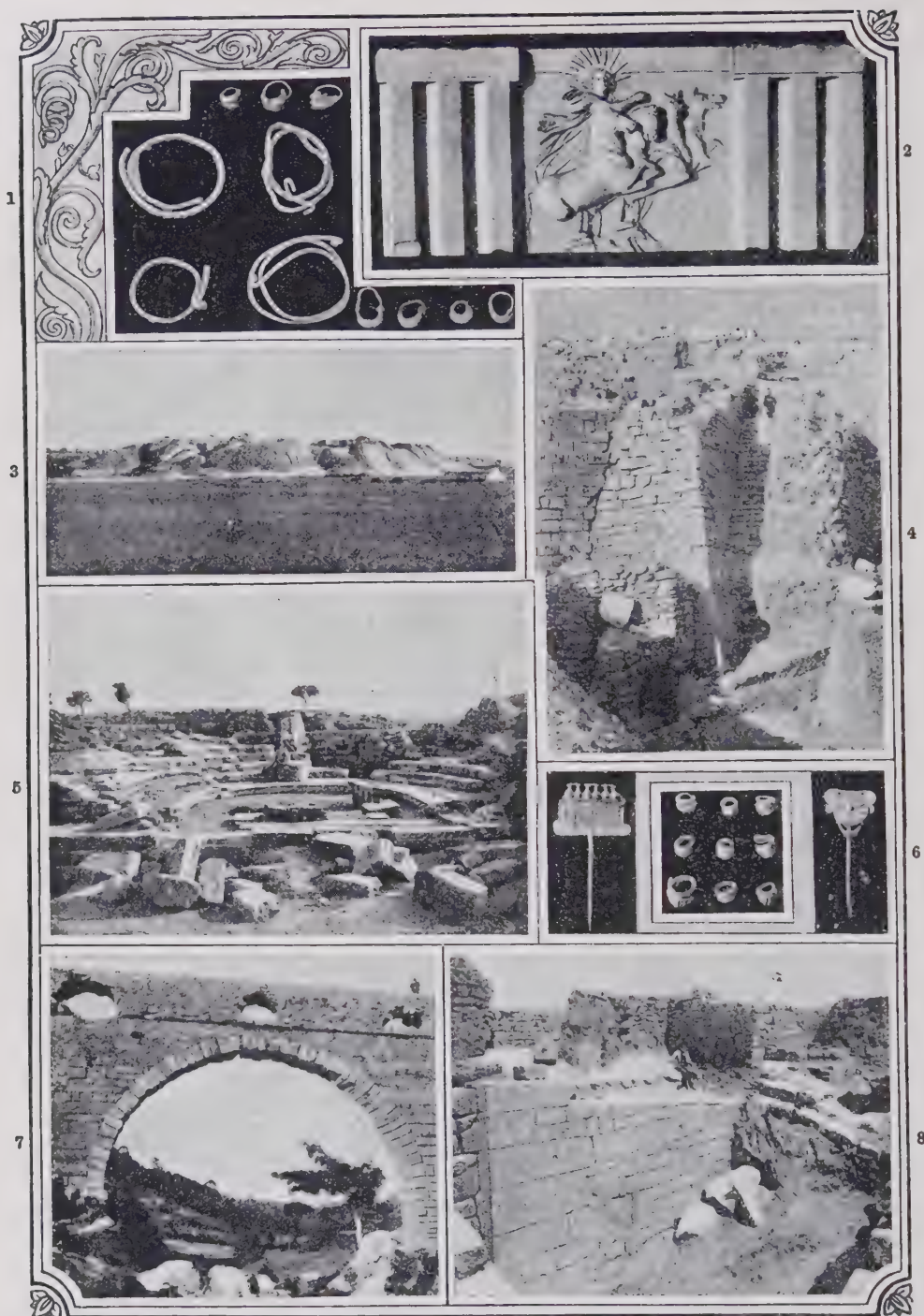
The style of building corresponds more closely with that found at other Mycenaean cities. The imported Mycenaean pottery fixes the date with even greater certainty. Lastly, huge *pthoi*, or jars, have been found similar to those of Cnossus in Crete, which certainly date about 1500 B.C. and later. The wall which remains is 16 ft. thick and 20 ft. high, sloping inwards; above this stood a vertical wall, 7 or 8 ft. thick and of unknown height. The main gate is on the s. The N.E. tower was found to have been built out to shelter a large well or cistern, 14 ft. square at the top, and descending 26 ft. into the solid rock. Behind these walls the town rose in successive terraces. Other existing buildings are a series of stone chambers, containing large jars, some of which, when found, were still full of pease or barley, and several houses on the first terrace. In the sixth city no treasures of metal were found; but in the second city Schliemann found in May 1873 a mass of treasure, comprising two diadems of gold chains, six bracelets, many earrings, and two cups of gold, six silver vases, several silver bars—perhaps used as money—copper axe-heads and spear-heads, copper daggers, and copper cups and pots. Most of these are now in the Völker Museum at Berlin; much of the rest is in the museum at Constantinople. See Schliemann's *Ilios* (1881) and *Troja* (1884); Schuchardt's *Schliemann's Excavations* (1891); *Annual of the British School of Athens for 1894-5*; H. R. Hall's *Mycenaean Age* (1901); Tsountas and Mañatt's *Mycenaean Age* (1891); Ridgeway's *Early Age of Greece* (1901); and, above all, Dörpfeld's *Troja and Ilion* (1902).

Troy, city, New York, U.S.A., co. seat of Rensselaer co., on E. bk. of Hudson, 8 m. above Albany. The principal manufactures are furnishing goods, shirts, beer, and iron and steel products. Rensselaer Polytechnic Institute is here. Pop. (1900) 60,651.

Troyes (Lat. *Augustobona*), tn., cap. of dep. Aube, France, on l. bk. of Seine, 104 m. by rail E.S.E. of Paris; has manufactures of hosiery. It is said to have given the name to troy weight. The cathedral has a particularly fine Flamboyant western front, and the old abbey of St. Lupus contains the town library. Here was signed in 1420 a peace between Henry V. of England and Charles VI. of France. Pop. (1901) 53,146.

Troyes, CHRISTIEN DE. See CHRÉTIEU.

Troyon, CONSTANT (1810-65), French animal painter, born at Sèvres; began his art career as



Relics of Ancient Troy.

1. Trojan jewellery. 2. Helios and his team: metope from the Temple of Athena. 3. The hill of Troy. 4. North-east tower of Grecian staircase. 5. The theatre. 6. Trojan jewellery. 7. Arch of the Roman aqueduct in the Thymbrios valley. 8. Walls of various periods.

painter on china. An extremist of the romantics, he was strongly influenced by Diaz, Dupré, and Huet. In 1846-8 he studied in Holland, learned to moderate the extravagant vehemence of his early work, and developed his fine pictorial qualities. At his highest he is a painter whose brushwork suggests Velasquez, a magnificent colourist, a master in landscape, and in the portraiture of cattle in relation to their environment of light and air perhaps the greatest artist the world has yet seen.

Troy Weight. See WEIGHTS AND MEASURES.

Trübner, NIKOLAUS (1817-84), German publisher, was born at Heidelberg. He came to London, and entered the service of Longman the publisher (1843); and in 1852 he commenced business for himself, and rapidly developed an extensive connection in England and the United States. He was an enthusiastic Orientalist, and specialized in the publication of learned works—e.g. his Oriental Series and his British and Foreign Philosophical Library.

Truce, a suspension of arms for a stated period between opposing armies, by agreement between the commanders, for the purpose of burying the dead after battle, exchange of prisoners, or negotiations. The conditions of truce have been more particularly determined by the Hague Conference.

Truce of God. See GOD'S TRUCE.

Truck, nautically used for (1) one of the cylindrically-shaped pieces of wood with holes in them seized to rigging as fair-leadings for ropes; (2) the circular piece of wood fixed like a cap on the top of a masthead or flagstaff, generally provided with sheave holes, through which the halyards are rove; (3) the wheels of a gun-carriage.

Truck Acts (1831, 1887, and 1896) make it illegal for an employer to pay his workmen otherwise than in the current coin, or to impose any condition as to where the wages shall be spent. The term 'employer' includes clerks, bailiffs, and foremen, and the term 'workmen' includes any person, except a domestic or menial, who, being a labourer, servant in husbandry, journeyman, artificer, handicraftsman, or otherwise engaged in manual labour, has entered into a contract with an employer to execute any work or labour. But a contract to provide a servant in husbandry with food and non-intoxicating drink and a cottage is exempt. An employer breaking the act is liable on a first offence to a fine of £10, on a

second £20, on a third £100. The employer may also agree to provide a workman with medicine, tools for mining, fodder for his horse, to let him his house, or to provide him with victuals to be consumed on the premises. If a contract in writing is made to that effect, sums not exceeding the true value of the articles supplied may be deducted from the wages. The Act of 1896 places restrictions on the exaction of fines from workmen. The factory and mines inspectors supervise the working of the acts. In April 1906 a parliamentary committee was appointed to inquire into the working of the Truck Acts.

Truffles, underground fungi belonging to the division of the Ascomycetes. They have much the same appearance as potatoes, but their structure is entirely different. When old they become full of brown spores, much like puff balls, but when young they are fleshy in texture. Several species are edible, and are highly valued as flavouring agents. These mostly belong to the genus *Tuber*, *T. aestivum* being the best-known species. Truffles are found usually under oaks, and dogs, sometimes pigs, are specially trained to point out the spots.

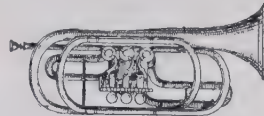
Trujillo. (1.) Seaport tn., Honduras, Central America, on the Atlantic, 140 m. N.N.E. of Tegucigalpa. (2.) City, prov. Caceres, Spain, 27 m. E. of Caceres. The ancient city is at the foot of a hill of the Montañez range. Pop. (1900) 12,512.

Trullan, the name of a hall in the imperial palace at Constantinople, in which the Trullan or Quinisextine Council of the Church met in 692. The latter name came from its being supplemental to the fifth and sixth councils. The sixth (also sometimes called Trullan) was assembled by the Emperor Constantine Pogonatus in 680 to deal with the heresy of the Monothelites. This is also known as the third Council of Constantinople.

Trumbull, JAMES HAMMOND (1821-97), American philological and historical writer, was born at Stonington, Connecticut; was assistant-secretary of state of Connecticut (1847-52 and 1858-61), secretary (1861-4) and librarian (1863-91) of the Watkinson Free Library in Hartford. He edited *The Colonial Records of Connecticut, 1636-89* (1850-9), *Lechford's Plain Dealing* (1867), and *Pierson's Some Helps for the Indians* (1873); and wrote *The Origin of M'Fingal* (1868), *The Best Method of Studying the Indian Languages* (1871), *On the Algonkin Verb* (1876), and *The True-Blue Laws of Connecticut* (1881).

Trumbull, JOHN (1750-1831), American lawyer, poet, and author, was born at Westbury (now Watertown), Connecticut; was tutor at Yale (1771-3), and wrote *The Progress of Dullness* (1772-3), a satire on methods of education. He settled as a lawyer in New Haven (1774) and at Hartford (1781). He was a member of the legislature (1792 and 1800), and judge of the Court of Errors (1808-19). He wrote *Elegy on the Times* (1774), and *M'Fingal* (1775-82), a revolutionary satire.

Trumbull, JONATHAN (1710-85), American statesman, born at Lebanon, Connecticut; was elected to the Assembly (1733), and became its speaker (1739); governor of Connecticut (1769, resigning in 1783). He was a leader of the Whigs of New England, and it is said that the epithet 'Brother Jonathan' originated from Washington's habit of addressing him by that title. See *Stuart's Life* (1859).



Trumpet.

Trumpet, the earliest known form of brass wind instrument. The modern orchestral trumpet consists of a tube about 5 ft. 6 in. long, curved twice to form three lengths. The lower 15 in. widen into a bell; the rest of the tube is cylindrical, and is surmounted by a cupped mouth-piece. By the use of movable sections, termed crooks, the tube can be lengthened to about 8 ft., each change of crook causing a corresponding change in the key of the instrument. The natural sounds of all trumpets are those of the usual harmonic series, but the form described contains either a slide or a number of valves, by means of which the intervening chromatic notes also may be produced. See TROMBONE.

Trumpeter, a general name given to the members of the Psophidæ, a family of cranelike birds inhabiting S. America. The best-known species is the agami. The name trumpeter is also applied to the American swan (*Cygnus buccinator*). See SWAN.

Trumpeter-fish (*Latris hecateia*), an important food-fish found off Tasmania and New Zealand, which is largely eaten both in the fresh condition and in the smoked. It reaches a weight of from 30 to 60 lbs., and is of good flavour. It belongs to the family Cirrhitidæ.

Trumpet-fish (*Centriscolopax*), a small marine fish, about five inches long, red or

green above and silvery below, with an elongated and tubular mouth. It is sometimes found on the southern coasts of Britain, and is used as food in the Mediterranean area.



Trumpet-fish.

Trumpet-flower. See **TRICOMA**.

Trunk-fish, a name sometimes given to the coffer-fish.

Truro. (1.) City and munici-
bor., Cornwall, England, 11 m.
S.W. of Falmouth. The epis-
copal see was founded in 1876,
and the cathedral in 1880. The
city, which had formerly a trade
in tin and copper, is now princi-
pally a market town. Stannary
courts were formerly held here.
It has a grammar school dating
from the reign of Henry VII.
Pop. (1901) 11,562. (2.) Town,
Nova Scotia, at the head of
Cobequid Bay, 51 m. N.W. of
Halifax. Pop. (1901) 3,998.

Trust. See **TRUSTEES**.

Trust (*Latin*) is an obligation
laid upon some person (called the
trustee), who is thereby bound to
deal with property over which he
has control (called the trust prop-
erty), for the benefit of certain
persons called the beneficiaries,
or *cestui que trust*, of whom he
may or may not be one. A trust
may be created by deed, will,
writing, or word of mouth, or
even without words, as when
money is put into a poor-box.
The great majority of private
trusts are express trusts, and the
great majority of express private
trusts are settlements by will or
deed, by which property is given
to trustees on trust to turn it into
money, to invest the money, to
pay the income to certain persons
for life, and after their death to
pay the capital to certain other
persons. It is dangerous to the
trust and unfair to the trustee to
appoint a sole trustee. It is not
generally wise to appoint only
beneficiaries trustees. The court
has now in all cases power to fill
a vacancy, but an express power
saves difficulty and expense. If
it is desired to allow investments
other than those in which trustees
may by law invest, it is well to
give fairly wide powers. A trustee
should keep in mind the fol-
lowing points:—(1.) That the law
expects the same prudence from
him as a prudent man exercises
in his own business. (2.) That he
is personally liable to make good
any losses arising from his im-
prudence or negligence. (3.) That
he must abide strictly by the
terms of the trust. This rule ap-

plies particularly to investments.
(4.) That he must not delegate
his duties to others, either by
allowing another trustee to trans-
act all the business, or by em-
ploying bankers, solicitors, or
agents, except in the ordinary
course of business. (5.) That if
he is allowed to lend on mort-
gage, he must employ an inde-
pendent valuer, and not lend
more than two-thirds of the value
of the property, nor lend upon
contributory or equitable mort-
gages. (6.) That he must not
make any kind of personal profit
out of the trust unless authorized
to do so by the trust deed. (7.)
That he must render accounts
when asked by the beneficiaries.
For his own protection a trustee
should (1) take the opinion of the
court at the expense of the fund
in all cases of doubt; and (2) ob-
tain a release on his retirement.
If a trustee dies, the trust passes
to the surviving trustees; and if
the last trustee dies, the trust
passes to his executors or admin-
istrators. When a breach of trust
has been committed, each trustee
is liable to the beneficiaries for
the whole of the loss; but an in-
nocent trustee has a right to be
recouped for his loss by a guilty
trustee. See *Lowin's The Law
of Trusts and Trustees* (11th ed.
1904); *Underhill's Manual of the
Law relating to Private Trusts
and Trustees* (ed. 1904).

Trust Company. A trust is
a combination of large scale pro-
ducers who have agreed to act
together from the first purchase
of raw material till the dividend
is ready for distribution. The
first effort in the formation of a
trust is to bring about an agree-
ment not to cut prices, to divide
territory; but if fair play is not
observed by all the parties, as
it seldom is for long, then the
agreement has to be drawn closer,
and a pool is formed, whereby
the competitors bind themselves
still more strictly. But the pool
also breaks down, because they
do not play fair. Then comes the
trust, by which the competitors
give up their separate existence.
The shareholders of the various
businesses surrender their shares
in the original companies to a
board of trustees, who are en-
dowed with an irrevocable power
of attorney by the original share-
holders. The business of all the
companies or corporations is man-
aged by the trustees, who from
the total profits declare a divi-
dend on the trust certificates is-
sued to the shareholders in pro-
portion to their original holding
of stock. This was the form of
organization of the Standard Oil
Trust (1882), and was declared
illegal by the courts, and dissolved
into the original companies. But
the Standard Oil Trust has re-

mained unchanged in spite of its
formal dissolution.

It is claimed for the trust that
it represents a new and more
economical system of production,
just as the factory system was an
advance on the small industry of
the 18th century. Its defenders
lay stress on the economies it
effects by eliminating industrial
competition, which means waste;
it is to be feared, however, that
the real object of its formation
is the elimination of commercial
competition, which means mono-
poly.

Expert management, expert in-
vestigation of possible uses for
waste products, savings in trans-
portation, and savings in the cost
of marketing—e.g. travellers, ad-
vertising—these are claimed for
production on a large scale which
the trust supercedes. On the
other hand, the disadvantages and
limitations of large scale produc-
tion are intensified under trust
production. These are mainly
connected with hired manage-
ment, which, though it is expert,
is not a perfect substitute for the
owner's eye. It may be noted
in passing that the economies
effected in trust production are
at the expense of labour, which
is thrown idle and wageless;
whereas the idle capital is repre-
sented in the trust, and receives its
dividends. Moreover, the econ-
omy effected in advertising is
greatly exaggerated, for the arti-
cles subject to trust production—
e.g. sugar, linseed oil, petroleum,
steel rails—were not extensively
advertised at any time. On the
whole, however, while the bene-
fits of trust production in sup-
pressing industrial competition
are exaggerated, the economy is
nevertheless great, and may be
held so far to justify the trust.
The indirect method of ascer-
taining whether monopoly prices
are being charged, by comparing
the dividends paid with the nor-
mal return, is vitiated by the
great over-capitalization to which
all trusts are subject. On the
other hand, the trust system is
not so ruthless as competition.
It saddles the bankrupt or derel-
ict concern on the industry of
the country—that is to say, by
absorbing it it gives its capital a
claim for dividends. Not only
so, but it doubles, sometimes even
trebles, the capital on which divi-
dends are to be paid.

Trusts are most numerous in
the United States, where the ex-
istence of a high tariff makes it
easier to maintain a trust, because
possible foreign competition is
shut out. But trusts occur also in
Europe, especially in Austria and
Germany. The invasion of the
English market by the American
Tobacco Trust led to the forma-
tion of a rival union of English

companies, and to a long struggle, which nominally ended in the withdrawal of the American combination. Trusts have not generally succeeded in England, combinations being either genuine amalgamations or ultimate failures. See Lloyd's *Wealth versus Commonwealth*, Ely's *Monopolies* (1900), Jenks's *Trusts*, and Meade's *Trust Finance* (1903).

Trustee. See TRUST.

Trustee Savings Banks. See SAVINGS BANKS.

Trustee Stocks and Chanecery Stocks are securities in which trustees may invest trust funds without rendering themselves liable for any loss of capital through depreciation in the investment. The Trustee Act of 1893 gives a list of trustee securities, as follows:—Parliamentary stocks or government securities of the United Kingdom; real or heritable securities in Great Britain or Ireland; Bank of England stock; Bank of Ireland stock; India $\frac{3}{4}$ per cent. and 3 per cent. stocks; any stock hereafter issued by authority of Parliament, charged on revenues of India; any securities having interest guaranteed by Parliament; Metropolitan Board of Works or London County Council stocks; debenture stock created by Metropolitan Police District receiver; debenture, rent-charge, guaranteed, or preference stocks of any railway in Great Britain or Ireland that has paid not less than 3 per cent. per annum on ordinary stock for each of the ten years preceding date of investment; any railway or canal stock in Great Britain or Ireland leased for two hundred years or more at a fixed rental to any railway specified above; Indian railway debenture stocks of companies with interest paid or guaranteed by Indian Council; 'B' annuities, Eastern Bengal, and Sindh, Punjab, and Delhi, and 'B,' 'C,' and 'D' East Indian railways, and any like annuities of any other railway hereafter created; any Indian railway with fixed or minimum dividend paid or guaranteed by Indian Council; any debenture, guaranteed, or preference stocks of any incorporated or chartered water company in Great Britain or Ireland that has paid not less than 5 per cent. per annum on ordinary stock for each of the ten years preceding date of investment; any corporation stock of any borough having, according to last census return, 50,000 inhabitants; any county council stock authorized by Act of Parliament or Provisional Order; any water stocks issued by incorporated commissioners levying compulsory rates over areas containing 50,000 inhabitants, such rates not having exceeded 80 per cent. of author-

ized amount for ten years; and any securities authorized by order of the High Courts of Justice of England or Ireland. Colonial government, corporation, and Indian railway stocks redeemable within fifteen years from date of investment must not be purchased over redemption value, and if over 15 per cent. above such value are prohibited. The Trusts Amendment (Scotland) Act, 1884, makes some alterations on the above lists as far as regards trust funds; and by the Colonial Stock Act, 1900, trustees are permitted to invest in certain colonial stocks, of which the Treasury publishes a list in the *Gazette*. The list authorized by the Court of Chanecery is less rigid than that of the Trustee Act, and may be varied from time to time. Only money, however, in the control or subject to the order of the court can be placed in them.

Truth, a journal founded by Mr. Henry Labouchere in 1877 as a rival to the *World*. From the very first issue the success of *Truth* was assured. The latest and best-informed society gossip and stock exchange affairs have always had a conspicuous place in it; and another feature has been the 'Queer Stories,' originally written by Grenville Murray. Mrs. Crawford, until lately the Paris correspondent of the *Daily News*, also contributed letters from the French capital. The journal's greatest title to fame, however, has been its exposure of fraud and imposture. It is, in fact, recognized as 'the swindlers' scourge,' but its influence has also been active in the cause of charity, and for many years the *Truth* Toy Show (started in 1880), on behalf of the children in the hospitals, has been a regular incident of the Christmas season.

Trygon. See STING-RAY.

Tryon, SIR GEORGE (1832-93), English vice-admiral, was born at Bulwick Park, Northants. He served in the Crimean war, and in the Abyssinian expedition (1867), for which he was made a C.B. In 1891 he was appointed to the Mediterranean command. Whilst his vessels were manoeuvring off Tripoli in Syria, the *Camperdown* fatally rammed the flagship *Victoria*, which sank within a few minutes, carrying down with her Tryon and many of his officers and men. He was made a K.C.B. in 1887. See Fitzgerald's *Sir George Tryon* (1897).

Trypanosome (*Trypanosoma*), a genus of protozoan parasites, of which one species (*T. Brucei*) has been shown by Bruce to be the cause of tsetse-fly disease, while a similar parasite is apparently the cause of sleeping sickness in man. The trypanosomes

are introduced into the blood by the bite of the tsetse.

Trypsin, one of the pancreatic ferments, transforms albuminates into true peptones, which are sometimes called tryptones, as distinguished from pepsin peptones. The juice of the papaw tree contains a ferment, papain, whose action is identical with that of trypsin. For administration by the mouth trypsin must be enclosed in a capsule, which is insoluble in the stomach juices, but soluble in the intestine.

Tsad. See CHAD.

Tsadam, or Z Aidam, more correctly TSADUM, a region of Central Asia, lying between the northern and southern (Astintagh) ranges of the eastward extensions of the Kuenlun system, of not very well defined boundaries, but lying outside of Tibet and to the N.E. of it, though W. of the Koko-nor. The surface consists in various parts of hard saliferous clay, crumpled into low ridges, the whole being the dried-up bed of a former salt marsh or basin, or rather it is made up of a number of such basins, into which rivers frequently drain. The only inhabitants are a few Mongols.

Tsana, TANA, or DEMBEA, a large lake of Abyssinia, 20 m. S. of Gondar; area, 1,500 sq. m.

Tsar, TZAR, or OZAR, a Slav title meaning 'emperor,' and cognate with the Latin 'Cæsar.' It was used by the Grand Duke Vladimir of Russia early in the 12th century, and definitively adopted as the title of the reigning sovereign by Ivan the Terrible in 1547. The title of the empress is Tsaritsa or Czarina; of the heir to the throne, Tsarevitch or Csesarewitch; and of the Tsar's daughters, Tsarevna.

Tsarev, tn., Astrakhan gov., S.E. Russia, 200 m. N.W. of Astrakhan city, with remains of ancient Sarai, capital of the Mongol-Tartar khanate of Kipchack or the Golden Horde. Pop. (1897) 8,895.

Tsaritsyn, tn., Saratov gov., S.E. Russia, 204 m. S.S.W. of Saratov city, on the Volga; is an important river-port and railway junction. It has tanneries, breweries, brick works, manufactories of hydromel, mustard, conserves, and machinery; fisheries and market-gardening are the chief industries. Pop. (1900) 67,650.

Tsarskoe Selo, tn., St. Petersburg gov., N.W. Russia, 16 m. S.E. of St. Petersburg city. An imperial summer residence and resort of St. Petersburg society. Here are the Old Palace, built by Catherine I. in 1724; the Alexander Palace, built in 1792 by Catherine II., with a park containing the arsenal and its his-

torical museum; and the cathedral of St. Catherine. Pop. (1897) 22,353.

Tschaikovsky, PETER ILITCH (1840-93), Russian musical composer, born at Votkinsk in Viatka. He studied music under Rubinstein at St. Petersburg, from 1866-78 was professor of harmony and composition at Moscow, and subsequently devoted himself to composition. Though making free use of familiar Slavonic melodies and rhythms, his music is highly original and frequently intensely emotional; but in all its phases an undercurrent of melancholy is an ever-present feature. His orchestration abounds in gorgeous effects, and two of his symphonies—the *Pathétique* and the *Fifth*—are regarded as amongst the greatest examples of symphonic music. Among his best-known operas are *Eugene Onegin* (1879), *The Maid of Orleans* (1881), *Mazeppa* (1882), *The Enchantress* (1887), and *Iolanthe* (1893). He made several visits to Britain, to conduct performances of his works. See *Life* in German by M. Tschaikovsky (1901; Eng. trans. 1905), and in English by Rosa Newmarch (1900) and by E. M. Lee (1904).

Tschudi, EGIDIUS (i.e. GILES) (1505-72), Swiss historian, born at Glarus. His *Schweizerchronik* (1734-6) is a valuable storehouse of historical facts, notwithstanding that Tschudi invented or forged several inscriptions, added to others, and in many cases adapted history to suit his own purposes. He also wrote *Gallia Comata* (ed. 1758).

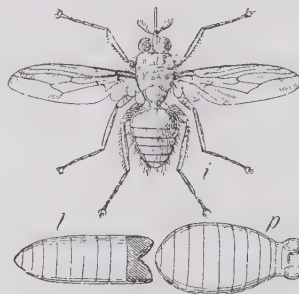
Tschudi, JOHANN JACOB VON (1818-89), a descendant of the above, resided (1838-43) in Peru. On his return he became Swiss ambassador at Vienna, where, assisted by his brother Friedrich (1820-86), also an antiquarian and naturalist, he prepared works on the Peruvian flora and fauna, antiquities, and also on the ancient Quichua language and its allied tribal dialects.

Tseng Ki-Tsch, MARQUIS (1839-90), Chinese diplomatist; in 1878 became Chinese minister to England and France, and in 1881 was sent as special ambassador to St. Petersburg to recover the province of Ili or Kul—a task which he successfully accomplished. He returned to China in 1886, and became a grand secretary and president of the Board of Admiralty.

Tséng-Kwo-fan (1811-72), Chinese statesman and general, was born in the province of Hunan. Distinguished as a scholar, he became literary examiner for the province of Sze-chuen (1843), and a member of the Board of Rites (1849). In the Taiping rebellion he did good work, and in

1860 he was appointed viceroy of the two Kiang provinces—a post he exchanged in 1862 for one of the chief secretariats of state. For his successful siege of Nanking (1862-4) he was created a marquis.

Tsetse (*Glossina*), a genus of dipterous insects, belonging to the same family as the house-fly (*Muscidae*), whose members are confined to Africa south of the Sahara. They are blood-suckers, and their bite is fatal to certain domesticated animals, notably the horse, ox, and dog. Quite recently it has been shown that the actual bite is not dangerous; but the flies are infected by a parasitic protozoon (*Trypanosoma*), which they introduce into the blood of the animal bitten. There the parasite multiplies rapidly, and produces a fatal disease known as fly-disease, or *nagana*. The species which habitually carries the parasite appears to be *G. morsitans*; but it is possible that other species, or even



Tsetse Fly.

z, Larva; p, pupa; i, imago.

other genera, of blood-sucking flies may also at times disseminate fly-disease. It was formerly stated that the bite of the tsetse was absolutely harmless to man; but in 1901 there broke out in the Uganda protectorate an exceedingly deadly disease, known as sleeping sickness, which is apparently disseminated by another species of tsetse (*G. palpalis*).

The members of the genus *Glossina* vary in length from $\frac{3}{4}$ to $\frac{5}{4}$ lines. In the resting position the wings lie closed flat over one another, while the proboscis projects horizontally in front of the head. The abdomen is usually marked with interrupted dark bands, and the rest of the body is grayish brown. The flies are confined to well-defined areas, known as fly-belts, which are often small, and usually in damp, low-lying localities, not far from water, and where there is abundant undergrowth. No cure for fly-disease in animals is known, but the fly has a considerable dislike to the presence

of man, and also to excreta of all sorts. See Austen's *Monograph of the Tsetse-flies* (1903).

Timshians, or CHIMMESYANS, North American Indians, whose territory lies on the Pacific coast opposite the Queen Charlotte archipelago. They speak a singularly harsh and difficult stock language, and number collectively about 5,000.

Tsou-hsien, tn., Shantung, China, 25 m. S.E. of Yen-chou-fu, with the tomb of Mencius.

Tsuga, a genus of hardy evergreen trees belonging to the order Coniferae. The leaves are narrow, and the flowers monocious. The cones are subglobose in form. The hemlock spruce (*T. canadensis*), with silver-striped, light-green leaves, is the best-known species.

Tsushima, a strait between Korea and Japan, 100 m. wide, divided near the centre by island of same name. Here the Russian fleet, under Admiral Rozhdestvensky, was completely destroyed by Admiral Togo in the Russo-Japanese war of 1905. See RUSSO-JAPANESE WAR.

Tuam, tn., Co. Galway, Ireland, 20 m. N.N.E. of Galway; now an episcopal see, formerly archiepiscopal (12th to 19th century). Pop. (1901) 2,896.

Tuaregs. See BERBERS.

Tube Flower, an East Indian shrub (*Clerodendron siphonanthus*), sometimes known as the Turk's turban, bears racemes of small, white, long-tubed flowers, followed by showy red berries.

Tuber, a thickened fleshy or scaly portion of an underground stem, which serves as a storehouse or depository for starch or other plant food. Tubers generally have buds, or eyes, from which new plants are produced. Potatoes and Jerusalem artichokes are examples.

Tubercle and Tuberculosis, a class of diseases which develop large numbers of small morbid lumps or tubercles of a special kind. This morbid tissue was in 1882 proved by Koch to be caused by a bacillus. A typical gray or milky tubercle consists of a cluster of large, oval, nucleated cells, with a considerable amount of protoplasm. Metchnikov believes these cells to be phagocytic leucocytes, which, in response to irritation by the bacilli, wage war against the micro-organisms. Around an original gray tubercle others speedily form, and their non-vascularity leads to the peculiar necrotic change known as caseation in the centre of the tubercular mass. After that the tubercular mass may dry up and become enveloped in a capsule of fibrous tissue, and the cheesy matter may become calcareous

from the deposition of lime salts within it. The bacilli thus become walled in, and the disease is cured or remains quiescent. On the other hand, the central part of the tubercle may liquefy and break down. Organisms other than tubercle bacilli may induce suppuration in the irritated and devitalized tissues around, so that an abscess is formed, from which the pus and caseous material may be discharged, leaving a cavity or tubercular ulcer. In its inflamed and weakened walls are formed new tubercular deposits, which repeat the processes of caseation and suppuration, and extensive destruction of tissue results.

Healthy tissues do not provide a suitable soil for the organism. Wild animals are generally insusceptible, but so liable to tuberculosis are domesticated animals, that some 40 per cent. of the cows in Britain are infected. Of mankind, about 12 per cent. die of some form of tubercle. The inhalation of dust containing tubercle bacilli derived from dried phthisical sputum is probably the chief mode of infection. Should it be protected from sunlight, such dust retains its virulence for years.

The organism as found in man is a short, narrow, slightly-curved rod, with rounded or pointed ends. Tubercle bacilli grow best at a temperature of about 98° F., but withstand extreme degrees of cold and a considerable amount of heat. Fresh air and light are inimical to them; but they acquire saprophytic powers and flourish for long periods outside a living host. Bovine and avian tubercle bacilli differ slightly in appearance and character from the human variety, which, however, produces tuberculosis when inoculated into lower animals. The question whether bovine and avian bacilli can infect man is at present *sub judice*. Koch thinks they cannot; but professional opinion and the balance of evidence appear to be opposed to his view, as are also the results published in 1904 in the interim report of the royal commission appointed to investigate the relationship of bovine and human tuberculosis. In 1890 Koch raised hopes that he had discovered a cure for tubercle in tuberculin, which is manufactured from the bacilli and their products. The hope has not yet been fulfilled, although tuberculin is certainly of use for diagnostic purposes in lower animals.

Of the tissues and organs affected by tuberculosis, the lung in the great majority of cases is the seat of the primary infection. In children, however, the organisms frequently gain entrance

through the alimentary tract, while in a few cases the skin is the tissue first attacked. In a considerable number of cases—for example, in tubercle of bones and joints—the point of invasion cannot be determined. Once established, the disease may spread by infecting other tissues. Heredity and the strumous, scrofulous, or tubercular diathesis were at one time considered of vast importance in the etiology of phthisis and kindred affections; now it is even denied that the children of consumptives are specially prone to the disease. Some indeed claim that a limited degree of protection is inherited, and point to the great susceptibility of savage races, which are without a history of ancestral tubercle. But in a home saturated with tubercle bacilli the chances of infection are enormous, and the progeny of tubercular parents may well inherit that increased vulnerability of the tissues which had contributed to the parental disease. The most pernicious occupations are those in which the workers inhale irritating dusts, such as steel and stone, and those which are carried on in crowded and ill-ventilated apartments.

To some extent tubercular patients may be isolated in special institutions, where sputum and other discharges can be destroyed. Compulsory notification of the disease is a useful measure, and the practice of spitting might be penalized with advantage. Until man has been proved to be insusceptible to animal tuberculosis, rigid measures should be adopted to prevent transmission of the disease by meat or milk. When tubercle bacilli have effected a lodgment, the patient should lead a healthy, open-air life. In a case of tuberculosis one of the best indications of favourable progress is a steady increase in the patient's weight. Tuberculosis of the skin may require Finsen's light treatment; tubercular glands may have to be removed; ulcers may call for scraping, and joints for excision. The earlier treatment is begun, the better the chance of arresting the morbid process. An International Congress on tuberculosis was held in Paris in 1905. For report of British delegates see Parliamentary Paper, Cd. 2898, for 1906. In June 1906 Dr. Calmette and M. C. Guérin of the Pasteur Institute of Lille claimed to have proved that protective vaccination against virulent tuberculosis can be given by intestinal absorption of bacilli modified by heat. Experiments had so far extended only over two months, so that its permanent effect has yet to be established.

Tuberosc. See POLLANTHES.

Tübingen, tn., Württemberg, Germany, on l. bk. of Neckar, 18 m. s.w. of Stuttgart; has printing establishments, dye-works, and mills. Its university, founded in 1477, has long been famous, particularly for philosophy and medicine. Melanchthon, Reuchlin, and Bebel were teachers in it; and F. C. Baur was the founder of the Tübingen school of theology (1825-60). In 1904 there were 1,581 students. The university library and observatory are accommodated in a 16th-century castle above the town. There is a statue of Uhland, who was a native. Pop. (1900) 15,338.

Tubuai, or AUSTRAL ISLANDS, a group of small islands in the Pacific, s. of the Society Is., crossed by 150° w., belonging to France. Among them are Tubuai, Raivavae, and Rimatara. Their products include bananas, oranges, sugar, cotton, and tobacco. Area, 115 sq. m.; pop. about 2,000.

Tuckahoe, or INDIAN BREAD, a name given to several American plants used as food by the Indians; also to the underground fungus *Pachyma Cocos*, which is without starch and mainly composed of pectose, and is widely distributed over the southern portion of the United States.

Tucker, ABRAHAM (1705-74), English philosopher, was born in London, and lived most of his life near Dorking. In 1756 he began the preparation of *The Light of Nature Pursued* (1768-78), a series of essays rather than a systematic treatise. See Mildmay's Life, prefixed to ed. of *The Light of Nature Pursued* (1805).

Tucker, CHARLOTTE MARIA (1821-93), English writer for children, known by the pseudonym of A.L.O.E.—*i.e.* A Lady of England—was born at Barnet, and did not commence her literary career till 1852, when *Claremont Tales* was published. Between 1854 and 1893 she published 142 separate books. In 1875 she went out to India as a missionary, and settled at Batala in the Punjab, where she laboured till her death.

Tucson, city, Arizona, U.S.A., co. seat of Pima co., 110 m. S.E. of Phoenix. Pop. (1900) 7,531.

Tucuman. (1.) Province, Argentine Republic, n.w. of Santiago del Estero. It is well wooded and abundantly watered, and in the north-west is very mountainous. Sugar-cane is grown. Several mines were worked in ancient times, but are now abandoned. Area, 8,926 sq. m. Pop. (est. 1904) 263,079. (2.) Town and episcopal see, cap. of prov. of same name, Argentina, 330 m. N.N.W. of Cordoba, near the foot of the Sierra Aconquija; is a beautiful town among orange groves, with fine buildings. Pop. (1904) 55,000.

Tudela, city, prov. Navarra, Spain, on the Ebro, 47 m. N.W. of Saragossa; has an interesting Gothic cathedral. Here the French defeated the Spaniards in 1808. Pop. (1900) 9,449.

Tudor, the surname of an English dynasty (1485-1603) founded by a Welsh nobleman who married (1423) Catherine, widow of Henry V. He was the father of Edmund, Earl of Richmond, and Jasper, Earl of Pembroke, and, supporting the house of Lancaster, was captured at Mortimer's Cross and beheaded (1461). Edmund married Margaret, heiress of John Beaufort, and their son, Henry VII. (reigned 1485-1509), founded his claims to the throne on his descent from John of Gaunt. The other Tudor sovereigns were Henry VIII. (1509-47), Edward VI. (1547-53), Mary (1553-58), and Elizabeth (1558-1603). See Gairdner's *Houses of Lancaster and York* (1874) and Hassall's *The Tudor Dynasty* (1904).

Tudor Style. See ARCHITECTURE.

Tuff, a volcanic ash bed, consists of scoria, lapilli, and fine sand and dust, such as are ejected by active volcanoes during an eruption. When beds of tuff contain large blocks, averaging several feet in diameter, they are called agglomerates. Tuff is common in all volcanic countries, either in layers alternating with lava flows or in great masses, which may fill the vents of old volcanoes.

Tugela, riv., Natal, British S. Africa, known in its upper reaches as the Buffalo, rises in the Drakenberg Mts. and flows east and south-east past Ladysmith and Colenso into the Indian Ocean. Below the junction of the Blood R. is Rorke's Drift or ford. The Tugela is liable to floods in summer, and is of no use for navigation.

Tugenbund (Ger. 'league of virtue'), a society founded at Königsberg in 1808, by the Prussian minister Stein, with the ostensible purpose of reviving patriotism and morality, promoting education, and reorganizing the army, but really with the object of driving the French out of Germany. Frederick William III. was compelled by Napoleon to dissolve it in 1809.

Tuileries, former imperial palace in Paris, the erection of which was begun by Catherine de' Medici in 1664, and completed by Louis XIV. It suffered severely at the hands of the mob in 1792, 1830, 1848, and 1871, being burned in the last-mentioned year. In 1883 it was removed, except two wings connecting with the Louvre. The garden of the Tuileries covers an area of about 75 acres, and is beautifully laid out.

Tuke, SIR JOHN BATTY (1835), English physician, was born at Beverley in Yorks. He began a distinguished medical career by taking charge of the British troops in New Zealand in 1857. On his return home he specialized in mental disease, and speedily acquired a reputation as one of the leading alienists in Scotland. He was knighted in 1898, and has represented the universities of Edinburgh and St. Andrews in Parliament since 1900.

Tuke, WILLIAM (1732-1822), founder of the York Retreat, was born in York of a Quaker family, and at an early age became responsible for the family business of wholesale tea and coffee merchants. In 1791 his attention was turned to the condition of lunatic asylums, and he induced the Society of Friends to take the matter up. In 1796 the York Retreat was opened, and the principle of humane treatment of the insane, which he advocated and practised there, was gradually adopted everywhere. See Hack Tuke's *History of the Insane in the British Islands* (1882).

Tula. (1.) Government, Central Russia, bounded on N. by Moscow. Area, 11,954 sq. m. Pop. (1897) 1,432,743. The surface is a plateau region, cut up by deep river channels, the highest point reaching 1,080 ft. Three-quarters of the government belong to the Volga basin through the Oka; the remainder falls to the Don. The chief minerals are coal (large and valuable deposits) and iron. The soil belongs mainly to the 'black earth' zone. Market-gardening is carried on in certain parts. The principal industrial establishments are distilleries, tanneries, sugar and oil works, iron and copper foundries; there are also manufactures of cloth, metal objects, and implements. (2.) Town, Central Russia, cap. of above gov., 106 m. S. of Moscow; is an episcopal see, with kremlin of 16th century, containing two cathedrals. There are iron foundries, locksmiths' shops, and manufactories of arms, machinery, samovars, and 'Tula metal' articles of all kinds, as well as of tiles, bricks, tobacco, confectionery, candles, and brushes; tanneries, breweries, distilleries, sugar refineries, and tallow foundries. Pop. (1897) 109,352.

Tulcea, tn. and river port, prov. Dobrudja, Roumania, at point where the Danube delta begins, 40 m. E.S.E. of Galatz; trades in grain, wool, and fish. Pop. (1900) 18,800. Here the Russians defeated the Turks in 1791.

Tuli, fort and station in S. Rhodesia, Matabeleland, 130 m. S.E. of Bulawayo.

Tulip, a genus of hardy bulbous plants, belonging to the order Liliaceæ. They bear usually showy, erect flowers, with more or less infundibuliform perianths. Grown in bold clumps in the mixed border, or in irregular groups among the rougher grass, their effect is much better than when planted in stiff rows. The bulbs should be planted about six inches apart, and from three to five inches deep (according to whether the soil be heavy or light), about the second week in October. Florists' tulips are divided into three classes, technically known as roses, bybloemens, and bizzarres. Roses are white ground tulips, marked or coloured with some shade of rose, scarlet, crimson, or red. Bybloemens are also white ground flowers, the marking colour being some shade of purple or black. The nearer the rose class approaches to scarlet, and the bybloemen to deep purple or black, the better. The bizzarres are yellow ground flowers, marked with shades of orange, scarlet, brown, or black. The tulip has a power of breaking, or rectifying as it is called. This means that some year or other a breeder or seedling blooms all variegated or striped and edged with colour, instead of the old self-colour it possessed before. The foliage also, which in a breeder is a solid shade of green, becomes mottled and remains so. But no one knows why or how tulips 'break.'

Tulip Tree (*Liriodendron tulipifera*), a hardy North American tree, belonging to the order Magnoliaceæ. It grows to 100 ft. in height, and bears in summer large, solitary, fragrant flowers, variegated green and orange. It is easily cultivated in a sheltered but not shady situation.

Tullamore, tn., King's Co., Ireland, on Grand Canal, 10 m. S.W. of Philipstown; with distilleries and breweries. Pop. (1901) 4,639.

Tulle, tn. and episc. see, cap. of dep. Corrèze, France, on riv. Corrèze, 50 m. S.W. of Limoges; has national factory of small arms. Its cathedral has a fine bell tower. Pop. (1901) 17,412.

Tulle. See NET.

Tullianum, or MAMERTINE PRISON, an underground cell in the state prison on the Capitoline Hill in ancient Rome, which is said to have been built by Ancus Martius. It was chiefly used as a place of execution—e.g. of Jugurtha, the Numidian king, Lentulus, Cethegus, and others of Catiline's fellow-conspirators.

Tullius, SERVIUS, sixth king of ancient Rome (578 to 534 B.C.). He established the *comitia centuriata*, a classification of the citizens of Rome according to

their wealth; he divided them also into four city (and possibly also seventeen country) tribes, in both classifications giving to the plebeians political rights; he surrounded the city of Rome with a wall, including within it the seven hills; and he formed an alliance between Rome and the cities of the Latin league.

Tulloch, JOHN (1823-86), principal of St. Andrews, born at Dron, Perthshire; was ordained minister of St. Paul's, Dundee (1845), and translated to Kettins, Forfarshire (1849). In 1854 he was appointed principal of St. Mary's College, St. Andrews. The leading churchman of his day, he was moderator of the General Assembly (1878). For a time he edited *Fraser's Magazine*. His principal works are *Theism* (1855); *Leaders of the Reformation* (1859); *English Puritanism* (1861); *Rational Theology and Christian Philosophy in England in the Seventeenth Century* (2 vols. 1872; 2nd ed. 1874); *Pascal*, in Blackwood's Foreign Classics (1878); *Modern Theories in Philosophy and Religion* (1884); *Movements of Religious Thought in Britain during the Nineteenth Century* (1885); *Beginning Life* (1862), long popular; *The Christ of the Gospels* (1864), lectures on Renan; *The Christian Doctrine of Sin* (1876), the Croall Lectures; and *Sundays at Balmoral* (1887). See Mrs. Oliphant's *Memoir of Principal Tulloch* (1888).

Tullochgorum. See SKINNER, JOHN.

Tullus Hostilius. See HOSTILIUS.

Tully, or TULLIUS. See CICERO.

Tulsi Das (1532-1625), Brahman poet and religious reformer, probably a native of Oudh, was the author of several poems, of which the *Ramayana* (part Eng. trans. by Growse, 1877-8) has been accepted by Rajputs as a religious work. Buddha sought to establish the universal brotherhood of man; Tulsi Das taught the universal fatherhood of God.

Tumbler, in mechanism, a kind of catch, which falls at the proper moment between two teeth of a wheel, and locks the mechanism so that it cannot move.

Tumour, a swelling caused by some form of new growth. Tumours fall into three groups—connective tissue tumours, epithelial tumours, and dermoid tumours.

1. *Connective Tissue Tumours*.—The great majority of these are of an innocent type, and their structure corresponds with that of the tissues in which they arise. They are usually encapsulated. As a rule, they grow slowly, and generally give rise to danger only by pressure upon important struc-

tures. All connective tissue tumours which exhibit malignancy are sarcomatous. Sarcomata grow rapidly, and having no capsule invade neighbouring tissues and organs. Their infiltration of blood-vessels leads to dissemination and to the production of secondary growths by the distribution of sarcoma cells to distant parts of the body. Their growth from small fragments explains their recurrence after incomplete removal. Of sarcomata three varieties are described. (1.) Round-celled sarcomata are composed of masses of round cells like those of granulation tissue. Such tumours grow rapidly, and are extremely malignant. (2.) Spindle-celled sarcomata grow more slowly, and approach more nearly to the structure of fibrous tissue. They are less malignant than the round-celled variety. (3.) Melanotic or pigmented sarcomata are extremely malignant, and of rapid growth. The cell elements are usually spindle-shaped.

2. *Epithelial tumours* contain epithelium as the essential and characteristic feature. When simple they are either papillomatous—that is, of a warty nature—or adenomatous—that is, glandular. Warts, although non-malignant, may endanger life: in the larynx they may cause suffocation; in the bladder they may produce fatal anæmia from continued hemorrhage; while pigmented warts frequently assume malignant characters. Adenomata arise from the epithelium of secreting glands, and often become cystic from the accumulation of perverted secretion. They have no tendency to recur, do not give rise to secondary deposits, and do not infect neighbouring lymph glands, but may endanger life from their size and from pressure upon vital organs. Malignant epithelial tumours are carcinomata (cancers), for which see CANCER.

3. *Dermoid tumours* contain skin or mucous membrane with cutaneous appendages, such as hair or teeth, and occur in situations where these structures are not found normally. With the exception of the ovarian variety, dermoid cysts are congenital. They are innocent; but moles sometimes assume malignant characters, and ovarian dermoids are dangerous to life in a variety of ways. Teratomata are sometimes confounded with dermoid cysts; but as they contain imperfect tissues of a suppressed but separate fetus attached to an otherwise normal individual, they must be classed with monstrosities rather than with tumours. Phantom tumour is a hysterical affection which often simulates pregnancy.

Tumult. See RIOT.

Tumulus, an artificial mound of sepulchral character. The largest known are the tombs of the Mikados of Japan, in Kachi and Yamato. Some of these ante-date the Christian era by many centuries. The interior consists of a large vault, built of unhewn and un-mortared stones, with converging or 'Pelagic' walls, roofed over by huge stone slabs, each weighing several tons. This vault is reached from outside by a gallery of similar structure. Over the whole building a mass of earth has been heaped, so that it resembles a natural hill. Modified forms of this kind of tumulus are found in other parts of Asia, and in Europe and America. Other tumuli are merely small mounds, containing in some cases an urn filled with burnt bones, or ashes, and in other cases a stone cist or coffin, in which an unburnt human body has been laid. Compare also BARROW and CAIRN.

Tumut, proposed Federal capital of the Commonwealth of Australia, in New South Wales, on an affluent of the Murrumbidgee, 264 m. s.w. of Sydney, and 94 m. N.E. of Albury on the Murray. Pop. (1901) 1,393.

Tun, a large cask for holding liquids, especially wine, ale, or beer. A tun is also a measure of capacity, equivalent to 252 wine gallons. In London a tun of beer was two butts. A tun of sweet oil consisted of 236 gals., and of syrup $3\frac{1}{2}$ barrels.

Tunbridge, now officially called TONBRIDGE, residential tn., Kent, England, 27 m. s.e. of London, on the Medway. Remains of a castle (*temp.* Henry I.), modern part containing museum. Grammar school founded 1553. The town is noted for its wooden (mosaic) Tunbridge ware. Pop. (1901) 12,736.

Tunbridge Wells, munic. bor. and wat.-pl., Kent, England, 4 m. s. of Tunbridge. The springs (chalybeate) were discovered in the reign of James I., and in the 18th century were much resorted to. The Pantiles is a fine promenade. Pop. (1901) 33,373.

Tundra, the cold desert area in the extreme north of Siberia and Russia. Frozen for most of the year, the surface soil is thawed in the long summer days, transforming the tundra into an almost impassable marsh, infested with mosquitoes. The reindeer is the camel of this desert. The inhabitants are nomadic or seminomadic huntsmen and fishermen, Chukches, Koriaks, Lapps, Samoyedes, and Ostiaks.

Tung-chou, city, prov. Chi-li, China, on r. bk. of Pei-ho, the terminus of through boat carriage

to Peking (16 m. distant); is the starting-place of tea caravans to Siberia. Sir H. S. Parkes, Lord Loch, and others were, on Sept. 18, 1830, treacherously made prisoners near the town, which was taken two days later, and again on Aug. 12, 1890, by allied forces.

Tung-kuan, customs station, prov. Shen-si, China, on r. bk. of Yellow R., below the junction of the Wei; a place of great strategical importance, through which passes the main route to Central Asia.

Tungsten, W., 184°0, a metallic element occurring in wolfram or tungstate of iron, and in scheelite or calcium tungstate. It is separated from the ore by conversion into sodium tungstate, or tungsten trioxide, followed by reduction by carbon in the electric furnace. Tungsten is a gray, hard metal, with difficulty fusible (m.p. 1700° c.), and of specific gravity 19.3. Its principal oxide is the acid anhydride, WO_3 , a yellow powder from which the tungstates are derived. Sodium tungstate is the most important of these, and is a white crystalline solid, which is used for fireproofing textiles, as a mordant, and, when partially reduced, as a beautiful bronze pigment. Tungsten itself is used for alloying with steel to produce self-hardening steels, and alloyed with nickel for ballistic purposes.

Tunguses, a Mongolo-Tartar people of E. Siberia, scattered in small groups between the Yenisei and the Pacific Ocean. Their chief divisions are Tungus proper ('Reindeer Tungus'), N. of the Amur R.; Lamuts, thinly spread round the shores of the Sea of Okhotsk; Samaghiris and Negdas, about the northern affluents of the Amur; Golds and Manzus, Ussuri R. and Lower Amur; Oroks, Sakhalin I.; Solons and Daur, Upper Nonni basin; and Manchus, who have been the political masters of China since 1643. The Tunguses are of distinct Mongolic type, and all, except the civilized Manchus, are fishers, hunters, trappers, and shepherds. A few are nominal Christians, but the great majority are still pure Shamanists. The Tunguses proper are noted for their astonishing powers of endurance, and for their high moral qualities. Manchu is the only cultivated Tungus language. See L. von Schrenck's *Die Völker des Amur-Landes* (1891); A. H. Keane's *Man, Past and Present* (1889).

Tunic, a garment of the ancient Romans, practically identical with the Greek *chiton*. It was an under garment of woolen material, originally made without sleeves, and usually with

short sleeves. It was worn by both sexes; but a man's tunic only reached to a little above his knees, while a woman's came down to her feet. Both sexes generally wore two tunics. A girdle was usually worn round the tunic, except in the ease of home life. The tunic was not a respectable dress without the addition of a toga; the poorer classes, however, as a rule wore tunics only. Senators and knights had a broad and a narrow purple stripe on their tunics respectively.



Tunicata.

1. *Ascidia microcosmus*. 2. *Phallusia mamillata*. 3. *Salpa democratica*.

Tunicata, a class of marine chordates. The more familiar forms are of the type of *Ascidia*, and occur fixed to stones or shells on the sea-bottom. An ascidian may be roughly described as a sac of jelly, usually several inches in length, fixed at one end, and having two openings at the other. The whole animal is enveloped in a tunic of a translucent substance, apparently identical with plant cellulose. It is to this tunic that the name refers, while the common name of sea-squirt is given on account of the fact that a living tunicate is capable of forcing a jet of water from each of its two orifices if molested. Of the two openings, one allows for the entrance of the water, used alike for feeding and breathing, and the other for its exit. The water passes into a large bronchial sac, which fills up the greater part of the body, and is not only the breathing organ, but is so constructed as to enable the animal to remove from the water the small organisms used as food. The eggs hatch into minute tadpole-like larvae, which possess all the chordate characters. Tunicates are divided into three orders:—(1) *Larvaceæ*, including forms such as *Appendicularia*; (2) *Ascidaceæ*, including both the simple ascidians and a number of colonial forms; (3) *Thaliaceæ*, including free-swimming forms such as *Salpa*.

Tuning-fork, a small percussion instrument of definite and permanent pitch, which is used to indicate the correct pitch—according to the standard adopted—of some particular note in the musical scale. It consists of two vibrating steel prongs, which

spring from a tapered base, and is most frequently tuned to A on the second or C on the third space of the treble staff. Pitch-pipes are sometimes used as substitutes for tuning-forks, but are less reliable. See **PITCH**.

Tunis. (1.) A French protectorate, N. Africa, covering an area of 51,000 sq. m., with a population estimated at from 2 to 3 millions. Good harbours have been made at Bizerta and Tunis, while there are roadsteads at Susa, Sfax, and Gabes on the E. coast. The interior may be divided into four regions—the Tell, central tableland, Sahel, and the Sahara. (1.) The Tell lies below the valley of the Mejerda, the only large perennial river in Tunis, and the Mediterranean coast. This region is mountainous, well watered, and wooded. (2.) The central tableland lies to the N. of a line drawn between Sfax and Gafsa, and extends to the Mejerda valley. It reaches an average elevation of 2,000 ft., the highest peak being just under 7,000 ft. The region bears a strong likeness, both in appearance and products, to Southern Spain. (3.) The Sahel is the coastal strip on the E., extending from Cape Bon to the Tripolitan frontier. Less well watered than the Tell, it is yet a region of high fertility. (4.) The Sahara, or desert region, lies S. of the central tableland, and includes the salt-lake district of the Jerid, or country of the date palms, and towards the Tripolitan frontier the Matmata plateau, which is separated by a plain 30 m. broad from the sea-coast. This region is one of sparse vegetation, with occasional boulder-strewn wadies, or water-courses. It produces esparto grass, or alfa, and in the Jerid, and especially on the island of Jerba (said to be the lotus-eaters' isle of the Greek poets), an abundance of dates. The rainfall, varying from 10 to 50 in., occurs chiefly in December and January, and is fairly well distributed over all the country except the Sahara region. The native inhabitants of Tunis are chiefly of Arab and Berber stock, and Mohammedan by religion. The white population was returned (1901) at 82,667, of whom 67,420 were Italian, 12,056 Anglo-Maltese, and 3,191 of various nationalities. Agriculture is the chief industry of Tunis. The fisheries (sardines, tunny, sponges) are of singular wealth. The mineral resources are great, including galena, zinc, salt (from lakes), and phosphates (notably at Gafsa). Imports (1904), £3,335,377; exports, £3,073,271. The French army of occupation numbers about 20,000, the native army about 600. Tunis formed part of the Roman province of Africa,

and the country is full of Roman remains—notably at Dugga (the Phœnician and Roman Thugga), in the Mejerda valley; near Feriana, where stood Thelepte; and at El Djem (Thysdrus) in the Sahel, which contains the best preserved amphitheatre in the world. To this day many of the old Roman irrigation works (as at Tozar in the Jerid country) are

others; L. Olivier's *La Tunisie* (1898); Hesse-Wartegg's *Tunis* (Eng. trans. 1899); and Broadley's *Tunis, Past and Present* (1882). (2.) Town, cap. of the above, is on the gulf of the same name. A shallow, landlocked lagoon separates it from the sea, but a canal cut through it ensures access to the town for ocean-going vessels. Pop. estimated at 250,000.

air, more effective explosives, and efficient ventilation, greatly expedited the work. The invention of the 'shield' and iron lining made subaqueous tunnelling in soft soil possible, and this system, combined with the use of compressed air, allowed construction through permeable strata to be carried on with safety to the workmen.

Construction.—In the English system the centre line of the tunnel is set out on the surface, from which shafts are sunk as considered necessary or practicable. Driving is then begun from these shafts in both directions. The top heading is first excavated and the crown bars with their poling boards set, these bars being 18 in. diameter or more, depending on the weight to be supported; then the heading is widened to the level of the top sill, and all the upper timbers are put in place. Excavation is continued down to the level of the lower sill, underpinning props supporting the top sill, and rakers being placed to stiffen the sills against the faces of the excavation. Sections from 10 to 18 ft. in length are thus completely excavated, allowing the centering to be erected and the bricklayers to build the lining. The crown bars are thereafter drawn forward to support the crown of the next section as it is excavated, these bars resting on the finished arch behind and on props in front. The section of the tunnel and the thickness of the lining depend on the nature of the material and the dip of the strata. In shallow ground the 'cut-and-cover' method is adopted. The Belgian system of tunnelling is especially useful where loose rock is met with. A top heading is first excavated, and the upper portion of the core removed to allow the crown of the arch to be built; this being underpinned in sections, the side walls are built and the central core then taken out. In the German system two parallel headings are run and the side walls built; then the upper portion of the core is removed and the arch built, props and centering being supported on the central core, which is finally removed. The amount of timbering required is reduced by this system. In America the whole tunnelling is often timbered, and this timber remains as the actual lining of the tunnel. A sound sandstone is the easiest material to tunnel through, and need not be lined. Occasionally pockets of running sand are met with, and these are both difficult and dangerous to tunnel. Igneous rocks require no lining, though they are difficult to bore.

Tunnels must be driven with a suitable gradient to carry off



still used to water the land. In 1575 the country was brought under Ottoman suzerainty, and the descendants of Ben Ali Turki, who made himself master of Tunis in 1691, still nominally reign as beys. The French occupied the country in 1881. See Sir Lambert Playfair's *Murray's Handbook for Algeria and Tunis* (1895); *La Tunisie au Début du XX^e Siècle* (1904), by Besnier and

Tunkers. See DUNKERS.

Tunnelling. The art of tunnelling is an ancient one, and the Romans especially effected many improvements in the methods of construction. A notable advance was made in the construction of Mont Cenis tunnel, the first to pierce the Alps, to facilitate railway connection between Italy and France. The engineers, by using rock-drills worked by compressed

drainage water. The gradient may be continuous, or may fall from the centre to both ends. The culvert is generally laid below the centre of the invert, or side channels may be made. The methods adopted in ordinary tunnelling can be applied to the driving of subaqueous tunnels where the overlying strata are not permeable to water, though there is always the danger of flooding and the necessity for pumping. The Severn tunnel—the longest in England—4½ m., was under construction from 1873 to 1886. Headings were driven from shafts on the shore, and the tunnel is lined with vitrified brick in Portland cement; being below the drainage level, pumping was resorted to. The gradient at the ends is 1 in 90 to 1 in 100, so as to carry the tunnel below the deepest part of the river-bed, and the central portion is level. The Mersey tunnel, between Liverpool and Birkenhead, also constructed on the ordinary system, is about 1½ m. long, and was opened in 1886, having been under construction for six years; it has a descent from the ends of 1 in 27 to 1 in 30, and the central portion is graded 1 in 900. The tunnel cost £284 per yard, including stations and rolling stock.

Long tunnels through mountain ranges must be driven from both ends, shafts not being possible. Ventilation then becomes an important factor, and cooled air must be forced in by fans up to the working face, where the air attains a high temperature. The Simplon tunnel through the Alps, opened in 1906, consists of two single-line tunnels. Two parallel headings, 56 ft. apart, forming the bottom headings of the tunnels, were driven by hydraulic rock-drills of the Brandt type and dynamite, and cross connections occur every 220 yds. One heading only was excavated at first to its full size, and the timbering and lining of masonry vary according to the nature of the strata traversed. The tunnel is 12½ m. long—the longest in the world. The gradient is 1 in 500, rising for 5½ m. from the north end, then falling to 1 in 143 toward the Italian end. Mt. Cenis tunnel was opened for traffic in 1871. It is 8 m. long, and cost £224 per yard. Hand-drills were used at first, then rock-drills. The St. Gothard tunnel, opened in 1881, is 9½ m. long, and cost £142 per yard. It was driven by an advance bottom heading and the arch built first, as in Mt. Cenis tunnel. Because of the large traffic, artificial ventilation is necessary. The Arlberg tunnel is 6½ m. long, and was opened in 1884. It cost £108 per yard. A

tunnel (8½ m.) through Mont Blanc has been projected.

The shield system of tunnelling was invented by Brunel, and was first used in 1825 in excavating the tunnel under the Thames, 1½ m. below London Bridge. The shield was constructed of cast-iron rings and divided into compartments, to allow the workmen to excavate at the working face and pass back the material. The tunnel was lined with brickwork, and the shield was pushed forward by screws as excavation proceeded. In driving the second tunnel under the Thames Barlow used the shield, but constructed the lining of cast iron in place of brick. Greathead probably advanced this system of tunnelling more than any other engineer, and it is now generally used for excavating deep level tunnels under the large towns for electric railways. There is little disturbance of the upper surface of the ground, and a great advantage is the speed of tunnelling. Ordinary brick tunnels can be run at about 1 ft. per day at each working face; but in the Central London Ry. tunnel an average speed of 6 in. per hour was maintained. In the City and South London Ry. tunnel beneath the Thames a pneumatic shield was used to keep out the water. The Greathead form of shield for excavating London clay consists of a cylindrical casting, about 2 in. larger in diameter than the cast-iron lining of the tunnel. Equally spaced around the casting and bolted to it are a series of hydraulic rams, the piston-heads of which bear against the iron lining behind. The front of the shield is formed of segmental castings, on which steel plates are fixed, forming a conical cutting edge. A diaphragm plate is fixed behind the castings, with a rectangular opening for access to the working face. A heading is run in front of the shield to give room for the men to work, and the shield is pumped forward by the rams. Grouting is run under pressure around the cast-iron lining to fill up the space left by the shield. When working under compressed air in water-bearing strata, a hooded shield is used to form a working chamber in front of the cutting edge, and cross diaphragms form chambers to shut off the working face from the tunnel behind, air locks being provided for access and for passing back the excavated material. See Stauffer's *Modern Tunnel Practice* (1906), Copperthwaite's *Tunnel Shields and the Use of Compressed Air in Subaqueous Tunnelling* (1905).

Tunny (*Thynnus Thynnus*), a fish belonging to the mackerel family, sometimes attaining a length of 10 ft. and a weight of

more than 1,000 lbs. It ranges from the south of England to Tasmania, and is very abundant in the Mediterranean, where the tunny-fishing has been carried on from a very remote antiquity. Large fixed nets are mostly employed. The flesh is red, and it is largely salted and otherwise preserved.

Tunstall, mrkt. tn., Staffordshire, England, 4. m. N.N.E. of Newcastle-under-Lyme; has manufactures of pottery, bricks, and iron. Coal is mined. Pop. (1901) 19,492.

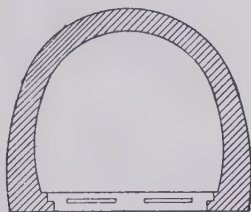
Tunstall, CUTHBERT (1474–1559), English prelate, was born in Yorkshire. He was dean of Salisbury (1521), bishop of London (1522), and bishop of Durham (1530). He was frequently sent abroad on special missions, on one of which, to Charles v., he formed a friendship with Erasmus, and on another, in 1527, was the companion of Wolsey. He accepted the royal supremacy, but hesitated before the reforms introduced in Edward VI.'s reign, and was deprived of his see. In the time of Mary he was restored, but had no share in the persecuting activity of that reign. On the accession of Elizabeth he was again deprived, because he refused to take the oath of supremacy (1559). Tunstall was the author of various theological and educational works, including *De Veritate Corporis et Sanguinis Domini nostri Jesu Christi in Eucharistia* (1551), one of the best contemporary statements of the doctrine of the eucharist.

Tupac Amaru, JOSÉ GABRIEL CONDORCANQUI (1742–81), Peruvian revolutionary, and known as the 'last of the Incas', was born at Tinta, south of Cuzco. He headed a rebellion against the Spaniards in 1780, but was defeated and captured in the following year, when he and most of his family were executed with barbarous cruelty.

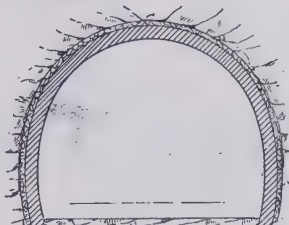
Tupelo Tree. See NYSSA.

Tupi-Guarani, the largest division of the South American aborigines, with two main branches—the Guarani and the Tupi of north-east Brazil, extending along the Amazons from the estuary nearly to the foot of the Peruvian Andes. Those of the Para district, having become civilized, form the crews of the trading canoes, are a quiet, good-natured people, and show great readiness in learning all trades. But all still speak the Tupi language, for which see GUARANI.

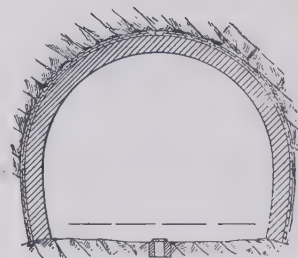
Tupper, SIR CHARLES (1821), Canadian statesman, born at Amherst, Nova Scotia. He has taken a leading part in Canadian politics, becoming premier of Nova Scotia (1864), and minister of inland revenue for the Dominion



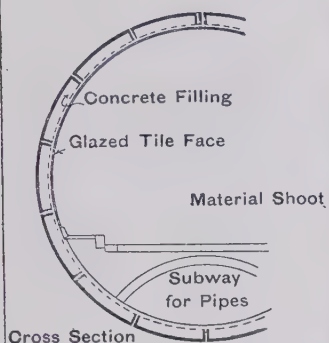
MONT CENIS TUNNEL



GREENOCK AND GOUROCK
TUNNEL

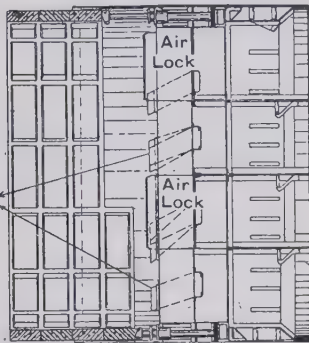


SPITZBERG TUNNEL



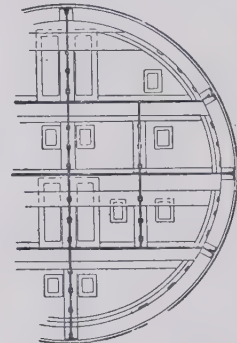
Cross Section

of Iron-Lined Tunnel

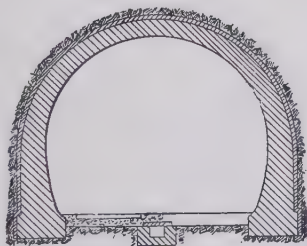


Longitudinal Section Showing Portion of
Completed Tunnel

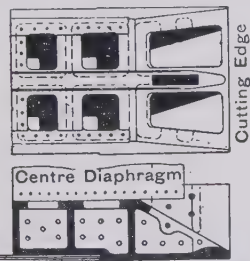
BLACKWALL TUNNEL



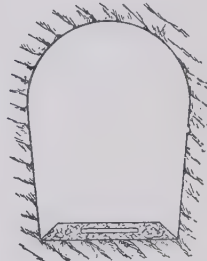
Front Elevation of Shield



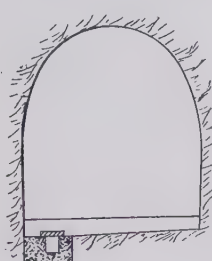
SURAM TUNNEL
The Trans-Caucasus Railway



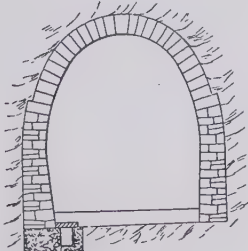
Steel Castings Forming Cutting Edge
of Shield



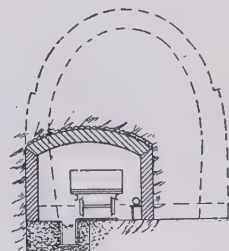
Transandine Railway



Without Lining



Strong Vertical Pressure
SIMPLON TUNNEL



In Bad Ground

(1872). He was minister of customs (1873), of public works (1878-79), and of railways and canals (1879-83), and in 1884 high commissioner in Great Britain for Canada. In 1896 he was secretary of state and leader of the Canadian House of Commons, and in the same year prime minister for a few months.

Tupper, MARTIN FARQUHAR (1810-89), English author, born in London of an old Huguenot family. To him we owe the well-known *Proverbial Philosophy* (1839-76), which ran into several editions. He also wrote several volumes of indifferent verse. See his *My Life as an Author* (1886).

Tupungato. See ANDES.

Turacos. See PLANTAIN-EATERS.

Turanian, a term applied in early ethnological writings collectively to the Turki peoples of Central Asia. When it began to be extended from the Turks to the Mongols, Finns, Ugrians, Manchus, and almost every non-Aryan race in Asia, the word became as vague as the Scythian of the ancients, and soon ceased to have any clear ethnical value. At present it is obsolete in serious anthropological works.

Turbary. See COMMONS.

Turbellaria. See PLANARIAN.

Turberville, GEORGE (?1540-1610), English poet, was born at Whitechurch. While on a mission as special ambassador to Russia in 1568, he wrote poems describing the *Places and Manners of the Country and People of Russia* (1568). His other writings include *The Booke of Faulconrie* (1575), and *Epitaphs, Epigrams, Songs, and Sonnets* (1567), as well as several translations of Italian poets.

Turbines, STEAM. The earliest form of steam-engine of which there is any record was invented by Hero of Alexandria (120 B.C.). In principle it was a crude form of steam turbine, and consisted of a hollow sphere mounted on two trunnions or pivots. Steam was supplied through one of the trunnions, and escaped through two short pipes fixed on opposite sides of the sphere, and at right angles to the axis of rotation. The ends of the pipes were bent at right angles to the plane containing the pipes and the trunnions, and pointed in opposite directions. The sphere was made to rotate by the reaction of the steam as it escaped tangentially from the ends of the bent pipes. Branca (about 1629) made a paddle-wheel which was impelled by a steam jet. The successful development of the steam turbine is the direct result of the investigations of the Hon. Charles A. Parsons. Several forms of the steam tur-

bine had been invented previous to the Parsons turbine, but none of them proved to be practicable machines.

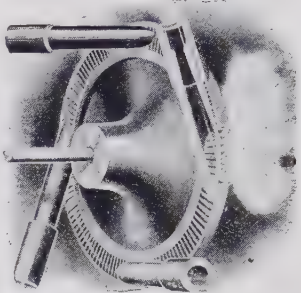


FIG. 1.

Principle of Action.—In a turbine the steam is made to act upon suitably shaped vanes or buckets attached to a wheel or

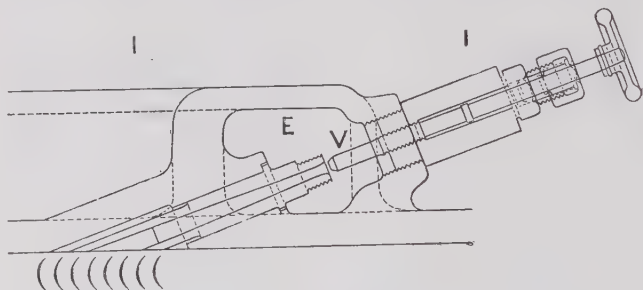


FIG. 2.

rotor fixed to the main shaft. When steam flows from one vessel to another in which the pressure is less—or in other words expands—it moves with a velocity depending upon the difference of pressure between the two vessels. It can be shown that if the velocity of the steam when leaving the vanes is to be a minimum—which is the condition of maximum efficiency in the working of the turbine—it is necessary that the peripheral velocity of the vanes should be about half the initial velocity of the steam. If the steam be made to act on several series of vanes, arranged in parallel rows so that the total expansion of the steam is divided up into a number of stages, the difference between the initial and final velocity in each stage may be made small, and thus the peripheral speed of the turbine wheel be reduced. It is this change in the velocity of the steam while it is passing through a turbine that brings about the difference of pressure on the internal surfaces, and thus causes rotation.

Steam turbines may be thus

classified:—(1.) Turbines in which the steam is expanded to its full extent before it comes in contact with the moving vanes; this is accomplished by means of suitably shaped divergent nozzles. (2.) Turbines in which the whole expansion of the steam is divided among many successive turbines of gradually increasing size. (3.) Turbines in which these two methods are used in combination. As actual successful working representatives of the above three classes, the De Laval, the Parsons, and the Curtis steam turbines will now be described and illustrated.

The De Laval Steam Turbine.—This turbine was first made and patented in a practical form in 1888 by Dr. G. de Laval of Stockholm. The steam is blown from stationary divergent nozzles against a single ring of vanes, mounted on the periphery of a revolving wheel. Fig. 1 represents the arrangement diagram-

matically. The expansion of the steam takes place entirely in suitably shaped nozzles, and is

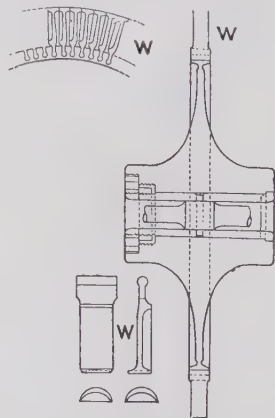


FIG. 3.

practically adiabatic. The potential energy of the steam is transformed into kinetic energy, and

the velocity of efflux is very high. The number of nozzles depends upon the pressure of the steam and the power required. A section through the nozzle and some of the vanes or buckets is shown in Fig. 2. Each nozzle is provided with a shutting-off valve, *v*, so that when the turbine is

account of the excessive velocity with which the steam impinges against the vanes of the De Laval turbine, the speed of the wheel shaft is very high, varying from 24,000 revolutions per minute in a 15 H.P. turbine down to 10,600 revolutions per minute in one of 300 H.P.

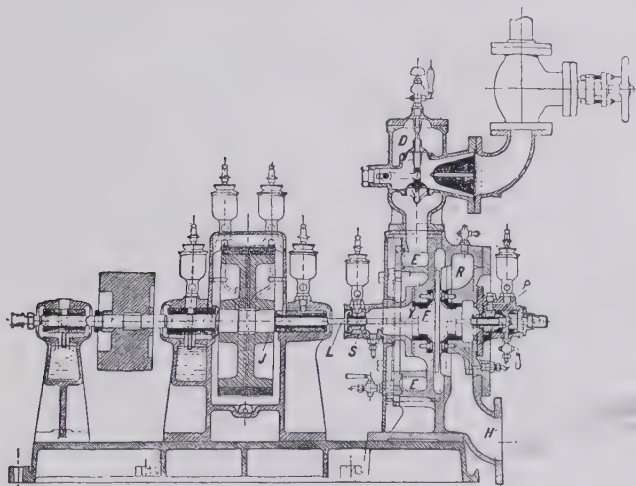


FIG. 4.

working at reduced loads, some of the nozzles may be closed. With this arrangement it is found that the consumption of steam per horse-power per hour at partial loads is not much greater than at full load. The machine

A section through the wheel and vanes of a medium-sized turbine is shown in Fig. 3. The shape of the vanes *w* and the method of dovetailing them into the wheel rim is clearly seen. The speed of the turbine shaft is

inches. The speed of the turbine is regulated by a very sensitive centrifugal governor, mounted horizontally on the end of the gear-wheel shaft. The governor controls the admission of the steam to the nozzle chamber. A vertical section of a small power De Laval steam turbine is given in Fig. 4. *R* is the turbine wheel mounted on its flexible shaft *L*, with bearings at *s* and *P*. The shaft carries a pinion which gears with a wheel, *J*. *D* is the governor valve, which admits the steam into the nozzle chamber *E*. The steam, after acting on the vanes, passes into a chamber, *R*, and out through the exhaust pipe *H*. The consumption of steam is considerably reduced by a preliminary superheating. Fig. 5 represents a De Laval steam turbine of about 300 H.P. capacity, driving two generators.

The Parsons Steam Turbine.—The Parsons compound steam turbine was first patented and made in 1884 by Mr. Parsons at Gateshead-on-Tyne. This turbine belongs to the second class, in which the whole of the expansion (adiabatic) is divided among many successive turbines of gradually increasing size, suitably proportioned for a very small fall of pressure at each turbine of the series. In this way the velocity of the steam is kept moderate, and the peripheral speeds of the vanes or blades do not exceed 300 ft. per second, while the speeds of rotation are suitable for direct coupling of the turbine to dynamos and to screw propellers of ships, without the intervention

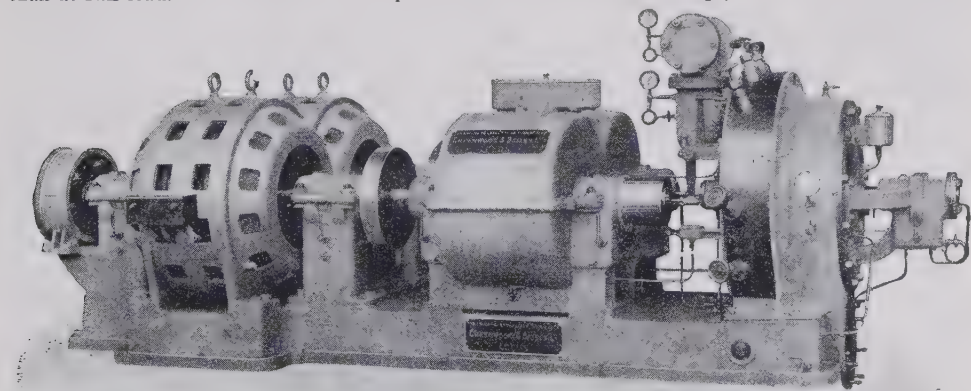


FIG. 5.

can be made to work with steam at any pressure between 50 and 200 lbs. per sq. in., and either with or without vacuum. The steam after leaving the vanes passes into the atmosphere or into a suitable condenser. On

reduced 10 to 1 by means of specially constructed double helical gearing made of steel. The very high speed permits of shafts of small diameters to be used; the diameter of the shaft for a 300 H.P. turbine being only 1½

of gearing. Fig. 6 is a sectional elevation of a Parsons compound parallel flow steam turbine; Fig. 7 shows diagrammatically the arrangement of the moving and fixed blades in section. The moving blades or vanes are mounted

on a steel spindle, drum, or rotor L, which is usually stepped up from the high-pressure end to the low-pressure end. The drum revolves within a casing, to the interior of which the guide blades are fixed. It will be seen that there is an annular space at all parts between the drum and casing, and this space is occupied by

of moving blades, and so on throughout the turbine until the steam finally escapes at E into the condenser. The steam is expanding constantly throughout its flow, consequently the sectional area between the blades must be gradually increased towards the low pressure or larger end of the turbine. The steam

it is of the utmost importance that a high vacuum be maintained in the condenser. With this object in view, a new apparatus, called a 'vacuum-augmenter,' has been designed by the makers of the Parsons turbine to assist the ordinary air-pump and condenser. It consists of a steam jet placed in a con-

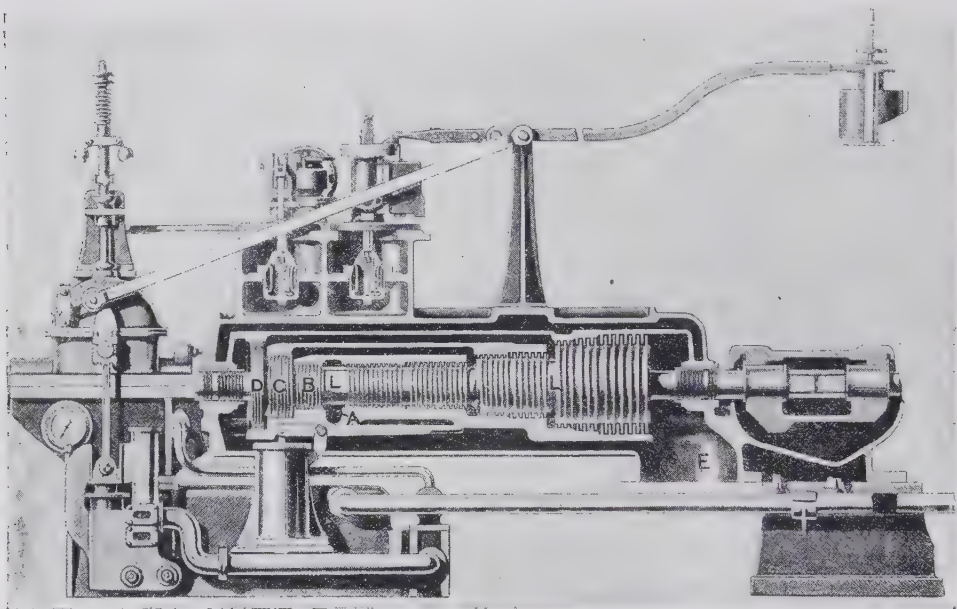


FIG. 6.

alternate rings of fixed and moving blades. The blades, which are of special bronze, are keyed into undercut circumferential grooves made in the drum and casing; the casing is divided longitudinally into two parts. Steam enters at A and travels to the right along the annular space

exerts an axial thrust in the direction of its flow, and in order to counteract this thrust, dummy pistons, B, C, D, are provided, consisting of collars formed on the drum and working in corresponding grooves cut in the casing. The steam is admitted to the turbine in a series of gusts regulated by the opening and closing of a double-beat valve, which is in its turn controlled by a steam relay worked by the governor. As the load on the turbine increases, the governor increases the length of the gusts, until at full load they are practically continuous. The governor can be either of the mechanical type, which keeps the speed constant, or of the electrical solenoid type, which maintains a constant voltage at the terminals of the dynamo. The cylinder does not require any lubrication, since the fixed and moving blades do not touch one another, and consequently the exhaust steam, when condensed, can be used direct as boiler feed. To obtain the most economical results as regards steam consumption with turbines,

traced pipe between the condenser and the air-pump, which acts in the same way as a steam exhauster, and draws any residual air and vapour from the condenser, and reduces the vapour density therein to about one-third. A water seal is provided to prevent the air and vapour from returning to the condenser. It is found that every 10° r. of superheat reduces the steam consumption by about 1 per cent. Each of the bearings consists of a brass bush surrounded by three concentric tubes, separated from one another by a thin film of oil, which damps all vibration. Many Parsons steam turbines of over 3,000 kilowatts capacity are now at work. A 1,400 kilowatt Parsons turbine with two generators, as supplied to the Glasgow Corporation, is illustrated in Fig. 8. The air and circulating pumps driven by electric motors are seen underneath, also the surface condenser; the speed of this turbine is 1,600 revolutions per minute. In Fig. 9 a turbine is shown opened up for examination; the guide blades

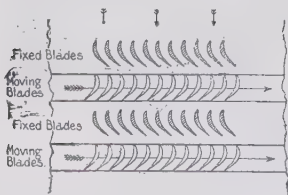


FIG. 7.

between the drum and casing. It first comes in contact with a ring of fixed blades, which guide its flow so as to strike the first ring of moving blades in such a manner as to cause the drum to revolve. The steam next enters the second ring of fixed blades, and is by them directed at the right angle on to the second ring

in the casing and the blades on the rotor are clearly seen. The casing opens on a hinge for easy access, and all accessories, such

turbine to the propulsion of ships has met with great success. The *Turbinia* was the first vessel to be constructed. Her engines

constructed for the British government. On a one-hour full-speed trial she maintained the mean speed of 36.58 knots, or about

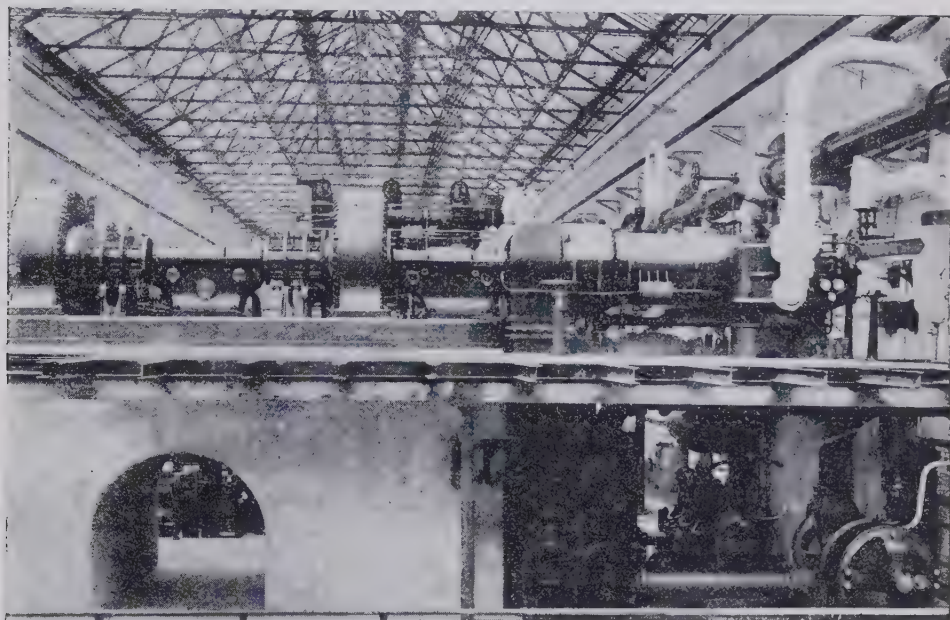


FIG. 8.

as governor, oil pump, etc., are placed at the side, so that it is unnecessary to dismantle anything in order to examine either the turbine or the bearings. In addition to driving electric generators, the steam turbine is largely used for driving fans for

consisted of three turbines—high pressure, intermediate, and low—on three separate shafts, each fitted with three propellers, the low-pressure turbine and also the reversing turbine being coupled to the central shaft. The trial of this vessel took place in the spring

42 miles per hour, the estimated power being 11,500 i.h.p. Unfortunately the *Viper* and a sister ship the *Cobra* were lost at sea in 1901 before any lengthy trials had been made.

The next important step taken in the development of the marine

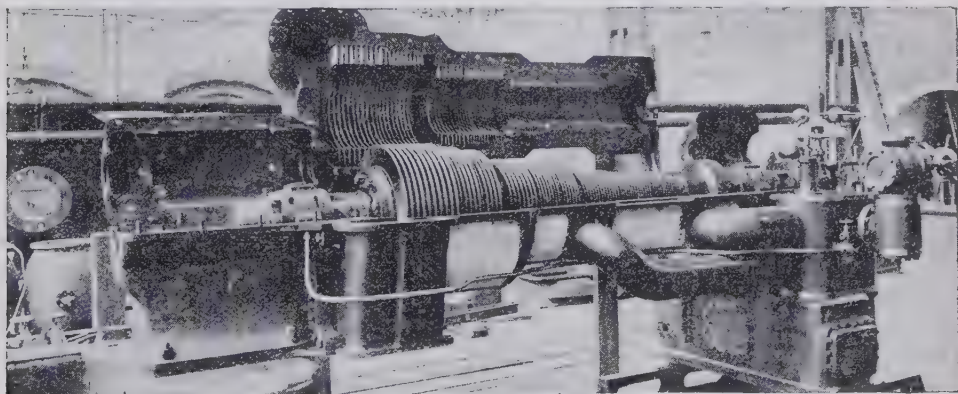


FIG. 9.

ventilating collieries, pumps, blowing engines, etc.

The Marine Turbine.—The application of the Parsons steam

of 1897, and a speed of 34½ knots per hour was attained. In 1898–1900 the steam-turbine torpedo-boat destroyer *Viper* was con-

structed for the British government. On a one-hour full-speed trial she maintained the mean speed of 36.58 knots, or about

knots per hour, with an estimated power of 3,500 I.H.P. The Allan Line were the first to adopt steam turbines for Atlantic liners by building the *Victorian* and *Virginian*, of 15,000 tons displacement, fitted with turbine machinery of about 12,000 I.H.P., giving a mean sea-speed of about 17 knots per hour. In 1905 the triple-screw turbine-driven Cunard liner *Carmania* was completed, and attained a speed (20.19 knots) of one nautical mile per hour greater than that of the *Caronia*—a sister ship identical in every respect except that she is fitted with ordinary reciprocating engines—when running under exactly similar conditions. In the *Carmania* there are two low-pressure turbines driving the port and starboard propeller shafts respectively, and one high pressure in the centre; the astern turbines (two) are placed on the low-pressure turbine shafts. The total number of blades amount

ciples involved in the De Laval and the Parsons turbines. In the Curtis turbine the steam is expanded in three or four stages, one wheel being pro-

turbine proper and directly coupled to the turbine shaft. The steam first undergoes a partial expansion while flowing through a set of one or more

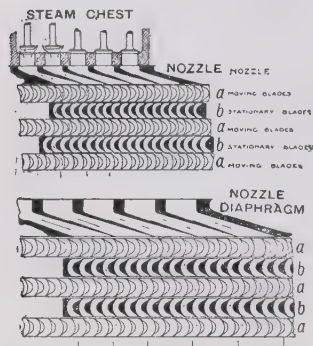


FIG. 10.

to about 1,115,000. At the present time (1906) two turbine-driven Atlantic liners, the *Lusitania* and the *Maritania*, are being built for the Cunard Company. They are of 70,000 I.H.P. each, and are estimated to give a speed of 25 knots per hour. H.M.S. *Dreadnought*, launched at Portsmouth in 1906, was the first battleship fitted with turbine engines. Comparing turbine-driven vessels with similar vessels fitted with reciprocating engines, it is estimated that there is a saving of from 10 to 15 per cent. in coal consumption in favour of the turbines, for the same speed and conditions. In turbine-driven vessels there is almost an entire absence of vibration, and there is also a saving in weight of about 5 per cent. by the adoption of the turbine system.

The Curtis Steam Turbine.—The principle of action of the steam in this turbine is practically a combination of the prin-

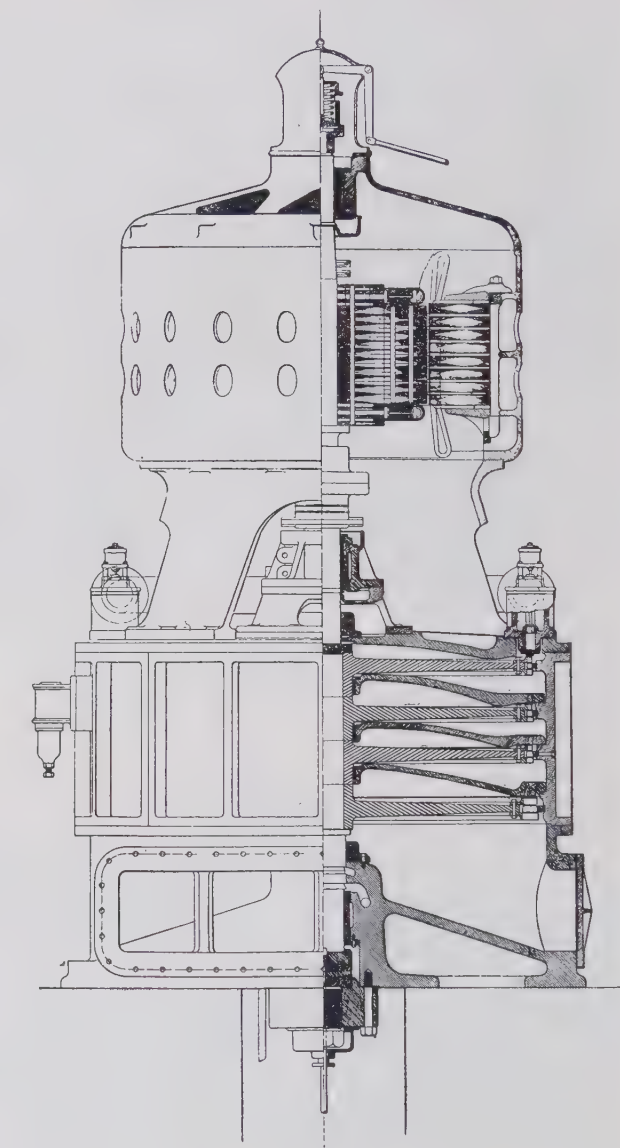
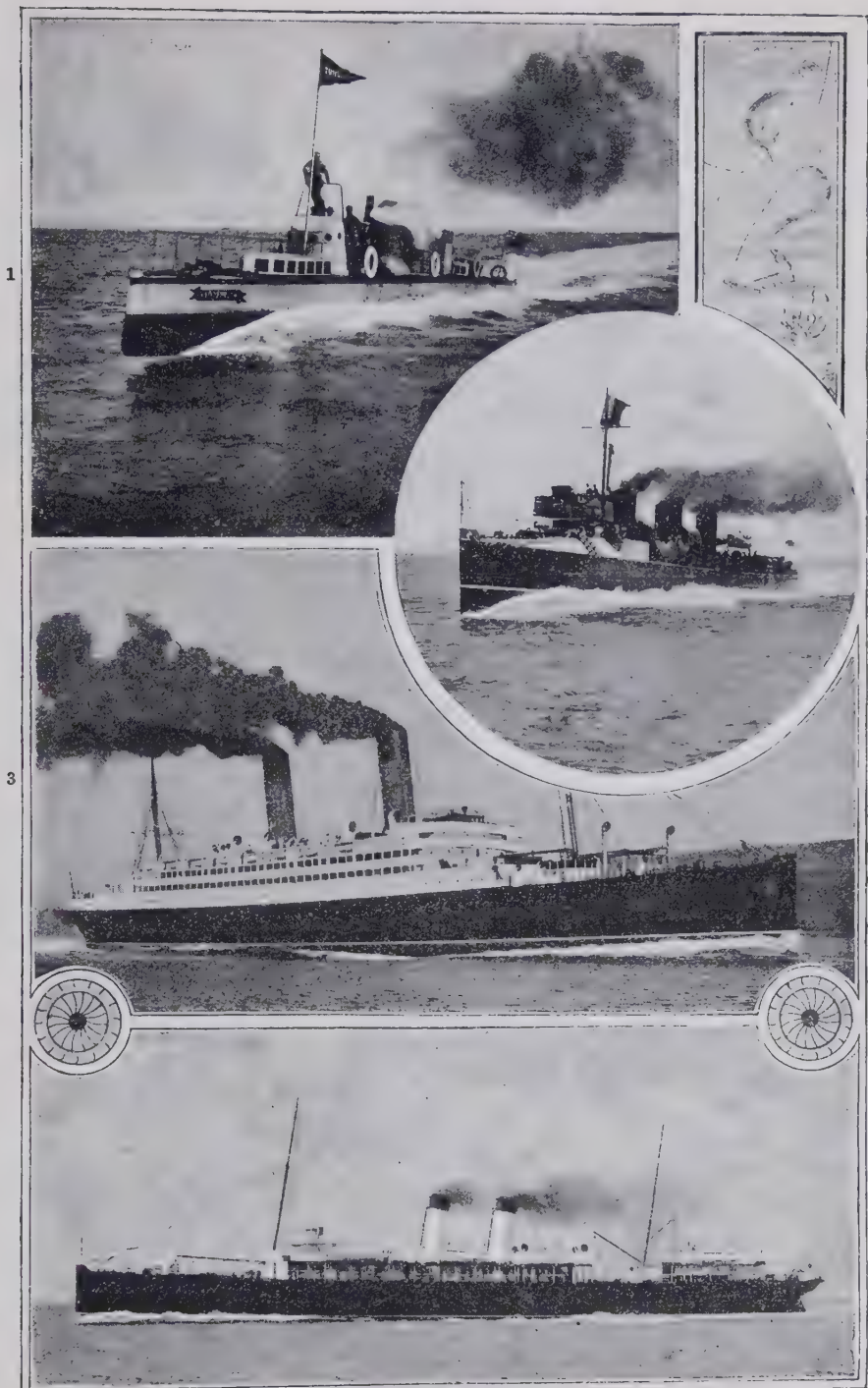


FIG. 11.

vided for each stage. The wheels are all about the same diameter, and are mounted on one vertical shaft supported by a footstep bearing. The generator is placed immediately above the

divergent nozzles, thus acquiring considerable velocity. It is directed against a ring of blades or buckets, forming part of the moving element or wheel. Fig. 10 shows diagram-



Examples of Turbine Steamers.

1. *Turbinia*, steaming 35 knots. (Photo by West, Southsea.) 2. *Viper*. (Photo by West, Southsea.) 3. *Carmania*, Cunard line.
4. *Invicta*, cross-Channel steamer, 22 knots, South-Eastern and Chatham Railway Co.

matically only the arrangement of the nozzles, also moving and fixed blades in a Curtis turbine. The steam then passes through a set of fixed blades or guides, which direct it against a second ring of moving blades attached to the same wheel as the first set; the above constitutes a stage. Fig. 11 shows a four-stage Curtis

passes to the blades or buckets in a broad belt, when all the sections are open. The number of stages and the number of rows of blades in each stage are governed by the degree of expansion, the peripheral speed of the blades, etc. A steam-tight diaphragm, A, is placed between every two stages, the only out-

riphery as the nozzles do. On account of the large increase in volume of the steam, and in order to keep the depth of the blades as small as possible, the last stage wheels are completely surrounded by nozzles and stationary guides. The turbine is sometimes placed directly on the top of the condenser. The governor is of the centrifugal spring-loaded type, and is generally set for a speed regulation of 2 per cent. between full load and no load, with a maximum variation of 4 per cent. In addition to the above speed regulating governor, an emergency governor is provided, whose function is to trip a trigger should the speed of the turbine increase 15 per cent. above the normal, and thus permit a weight to fall and give a hammer blow to a butterfly or damper valve in the main steam pipe, closing the valve instantaneously.

Fig. 12 is an illustration of a Curtis 500 kilowatt turbo-generator in the British Thomson-Houston Company's power house at Rugby.

There are many other varieties of steam turbine, such as the Rateau, Riedler-Stumpf, Zölly, and Schulz. The Rateau turbine has been designed to work with the exhaust steam from reciprocating engines. A Rateau heat-accumulator is placed between the engines and the turbine. The accumulator consists of a large iron chamber, provided with a number of shallow trays or basins, placed on top of one another and containing water, so as to provide a large evaporative area. The function of this accumulator is to condense the steam delivered intermittently from the engines, when more is entering than is being drawn off; and during the pauses, when less is being supplied than is required by the turbine, the pressure falls and the accumulated heat evaporates some of the water in the trays, forming steam, so that the turbine is kept constantly running. The consumption of exhaust steam per horse-power per hour seems to vary from 36 lbs. to about 55 lbs.

See R. M. Neilson's *The Steam Turbine* (1903), Dr. A. Stodola's *The Steam Turbine* (1905), Carl C. Thomas's *Steam Turbines* (1906), Alexander Jude's *The Theory of the Steam Turbine* (1906), Wilhelm Geutseh's *Steam Turbines* (1906), Stevens and Hobart's *Steam-Turbine Engineering* (1906), Thurso's *Modern Turbine Practice* (1906), and Garnett's *Turbines, Steam and Water* (1906).

Turbot (*Bothus* [*Rhombus*] *maximus*), a member of the Pleuronectidæ, or flat-fish family, distinguished by having the eyes

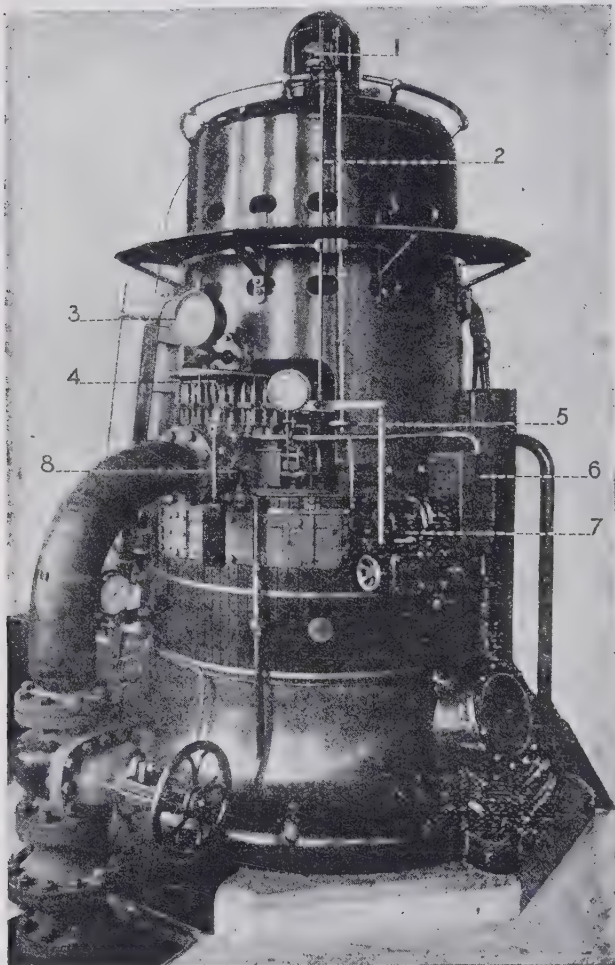


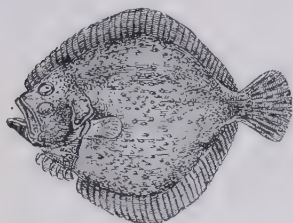
FIG. 12.

1. Governor. 2. Governor rod. 3. Tachometer. 4. Steam valves. 5. Synchronising hand-wheel. 6. Rheostat. 7. Controller. 8. Emergency stop valve.

turbine, partly in section; the generator is seen on the top. By this means a high steam velocity, acquired in the expanding nozzle, is made to impart motion efficiently to a comparatively slow-moving element. The nozzle is generally made up of a number of sections or units adjacent to one another, so that the steam

let for the steam being through the nozzles in the diaphragm. The operation of this type of turbine at light loads is virtually the same as at full load. The number of stationary blades or guides is dependent on the number of nozzles in the diaphragm for that stage, as they need only cover the same pe-

on the left side, a broad, somewhat diamond-shaped body, the absence of scales, and the presence of scattered bony tubercles. It is found in moderately deep and shallow water throughout the Mediterranean, Black Sea, and North Sea, becoming rarer in the north. It is predaceous, living on other fish, mostly sand-eels, sprats, and young herrings. It spawns from April to July, the eggs, which may number over ten millions, being buoyant.



Turbot.

Turdidae. See THRUSH.

Turenne, HENRI DE LA TOUR D'AUVERGNE, VICOMTE DE (1611-76), French general, was born at Sedan, his mother being a daughter of William the Silent. He distinguished himself in the later years of the Thirty Years' war and in Italy and Spain, and obtained the staff of a marshal in 1644. In the campaigns that followed he gave signal proof of two of his great strategic gifts—operating with effect between divided enemies, and making marches so rapid that they were the wonder of the time. In fact he contributed more than any single general to the triumph of France in the Thirty Years' war; but owing to the influence over him of the Duchesse de Longueville, and in some degree to resentment for injuries done to his brother, he took the side of the rebels of the Fronde, and for a time was in arms against his king and his country. He was, however, restored to favour by Mazarin and Anne of Austria. When he assumed command (1652) the enemies were around Paris, and had taken possession of parts of France; but Turenne slowly but surely made his way through Picardy and Artois into the Spanish Netherlands. At last he won in 1658 the important battle of the Dunes, overran Belgium, and compelled Spain to treat. The peace of the Pyrenees (1659) left France the first power of the Continent. After that her army was completely reformed by Louvois and Turenne, the French infantry being largely increased in numbers. Turenne knew the value of footmen. This great instrument of war was first tried in the invasion of Holland

(1667); but Turenne was not seen at his best in the early campaigns. His genius, however, shone out fully in the second phase of the campaign of 1672; and though he was baffled by Montecuculi in 1673, his campaign of 1674 was one of the finest ever known in war, especially his winter march behind the screen of the Vosges, which discomfited his astonished enemies. Turenne was again opposed to Montecuculi in 1675, but met a soldier's death when within easy reach of victory. Strategy was the special excellence of this great master of war. See *Collection des Mémoires du Maréchal de Turenne* (1782); *Life*, in French, by Duruy (ed. 1889), and in English, by Hozier (1885); and Chopin's *Précis des Campagnes de Turenne* (1888).

Turfan, *tn.*, E. Turkestan, between two branches of the Tian-Shan mountain system, in 43° 8' N. lat., 80° 35' E. long.; with 10,000 inhabitants. The ancient Turfan or Kara-Khoto of the Uigurs lies 30 m. w.; extensive ruins (chiefly Buddhist and Moslem) mark the site.

Turgai, *prov.*, Russian Central Asia, lying between Orenburg on the N. and the Aral Sea and Syr Daria *prov.* on the S.; with an area of 176,219 sq. m.; pop. (1897) 453,123. The province is divided into four districts—Turgai, Ilets, Irghiz, and Nikolayevsk. The surface is mostly steppe or prairie, varied by the S. extremity of the Ural Mts., and their prolongation in the Mugojar hills (on the W.). The chief mineral deposits are jasper, porphyry, coal, silver, lead, copper, and salt. The mass of the people are pastoral, and mostly Kirghiz. Felt and leather articles are made.

Turgenev, or **TOURGENIEFF**, IVAN SERGEEVITCH (1818-83), Russian novelist, was born at Orel, lived on his own estates, and devoted himself to literature. He first made himself widely known by his *Annals of a Sportsman* (1846; Eng. trans. 1885), a book in which he boldly exposed the wrongs of the serfs. Some utterances in 1852, displeasing to the Czar, caused him to be imprisoned for a short while, and confined to the bounds of his estate till 1855. Tired of Russian surveillance, he then took up his residence abroad, mostly at Baden-Baden and Paris. Turgenev was a master of the short story. In his *Nest of Nobles* (1858; translated as *Lisa*, 1869), and in *Helene* (1860; translated as *On the Eve*, 1861), he gives a vivid picture of dreamy and enthusiastic Russia in love with her ideals, and ever theorizing. In *Fathers and Sons* (1861; Eng. trans. 1867), *Smoke* (1867; Eng. trans. 1872), and *Virgin Soil* (1876; Eng. trans.

1878), he shows the influence of those Slavophile ideas which are having so great an effect on the growth of Russian thought. Like almost all Russian writers, Turgenev is often depressed. A vein of pessimism runs through all his stories. Turgenev, the lineal literary descendant of Pushkin, is the greatest prose artist in the history of Russian letters. His influence on modern literature has been very great, and many young French writers consider themselves his pupils. His *Novels* were translated into English by J. Hapgood (16 vols. 1905, etc.). See Turner's *The Modern Novelists of Russia* (1890), and *Life* by Thorsch (1886).



Ivan Sergeievitch Turgenev.
(Photo by Elliott & Fry.)

Turgot, ANNE ROBERT JACQUES, BARON DE L'AULNE (1727-81), French statesman, born in Paris; became (1753) a *maître des requêtes*. From 1761 to 1774 he was intendant of Limoges, where he carried out many beneficent reforms. Soon after the accession of Louis XVI., Maurepas appointed Turgot minister of marine, then controller-general of finances. Turgot opposed Louis XVI.'s suicidal policy of recalling the *Parlements*; but in spite of their opposition he re-established the freedom of the corn trade in the interior of the kingdom, and abolished the system of allowing the farmers-general, who were the contractors for a large portion of the taxes, to give larger gratuities to the courtiers. He also removed the disabilities of foreigners, reformed the abuses in the assessment and collection of town dues, and relieved the small farmers and manufacturers. In 1775 the nobles, who disliked Turgot's reforms, stirred up some bread riots. Among his

measures none was more important than the abolition of the *corvée* (Jan. 6, 1776) and the *jurandes* (March 12, 1776)—the former being the forced labour of the peasants upon the making and repairing of the highroads, and the latter the government of privileged corporations. Other reforms were the abolition of sinecures, the freedom of the wine trade, and the revision of government contracts. As a disciple of Quesnay, the founder of the school of physiocrats, Turgot maintained that land was the sole source of wealth. At the same time he had no wish to strengthen the popular element

la *Formation et la Distribution des Richesses* (Eng. trans. 1793), and *Extension de la Liberté du Commerce des Colonies*, were published by Dupont de Nemours in 9 vols. (1808–11). See Tissot's *Turgot sa Vie* (1862), Condorcet's *Vie de Turgot* (1786), Neymarck's *Turgot et ses Doctrines* (1885), and W. Walker Stephens's *Life and Writings of Turgot* (1895).

Turin (*Augusta Taurinorum*; Ital. *Torino*), chief tn. of prov. of same name, Piedmont, Italy, on Po, 78 m. w.s.w. of Milan. Among the older buildings are the Palazzo Madama, the Palazzo Carignano (now a natural history museum), the 7th-century Gothic

Mount Cenis and the Simplon tunnels favouring its transit trade. Electricity is used in most of the factories. Silk, woollen goods, paper, cotton, linen, and leather are manufactured. Wine and silk are exported. Turin was the capital of the Taurini, from whom it derived its name. Taken (218 B.C.) by Hannibal, it became a Roman colony under the Emperor Augustus. It came under the rule of the dukes of Savoy in the 11th century. During the 16th and 17th centuries it was alternately under France and Savoy. It was the capital of the kingdom of Sardinia till 1860, when it became



Turin, from the Monte dei Cappuccini.

in France. He was opposed to the meeting of the States-general, and held that all reforms should be initiated by the king. He recognized that the only means of rescuing France from the financial chaos into which she had fallen was by strict economy, by the taxation of all landowners, and by the preservation of peace. His reforms naturally made him many enemies, who at last proved too strong for him, and he fell on May 13, 1776. He had, however, restored public credit in the government. He left a surplus of eleven millions. Turgot's *œuvres*, including *Lettres à M. le Contrôleur-Général sur le Commerce des Grains*, *Réflexions sur*

cathedral, the royal palace; the modern include the Mole Antonelliana (containing the Risorgimento Italiano Museum). Picture galleries and museums are numerous and valuable—Royal Albertine Academy, Royal Pinacoteca, Museum of Antiquities, the Civic Museum. The university, founded in 1404, has over 2,600 students; and there are the School of Engineering, School of Veterinary Medicine, and Musical Academy. Among the many monuments the chief are those to Cavour, D'Azeglio, Victor Emmanuel II., Prince Amadeus of Savoy. Near the town is the Superga, the burial church of the house of Savoy. Turin is an important railway centre, the

the capital of Italy, remaining so till 1865. Pop. (1901) 335,656.

Turin, BATTLE OF. Victor Amadeus II. of Savoy having joined the European league against Louis XIV., the French invaded Piedmont and besieged Turin. With the help of Prince Eugène and an imperial army, Victor Amadeus defeated them outside the town (Sept. 7, 1706).

Turkestan, CHINESE or EAST-ERN, a region subject to China, lying between the Tian-Shan Mts. (N.W. and N.) and the Kuen-lun Mts. and Tibet (S.). Area, 431,800 sq. m. Pop. (1901) about 2,000,000. It is constituted almost entirely of the basin of the Tarim, which terminates in the inland marsh of Lob Nor. On

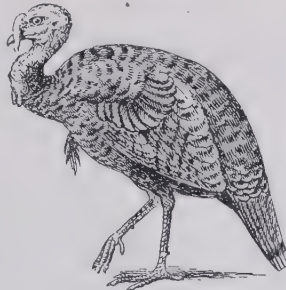
the s. numerous small streams (e.g. Khotan Daria, Keriya Daria, Cherchen Daria) run down from the Kuenlun, most of them becoming lost in the sands of the Takla-makan desert before they reach the Tarim. East of Lob Nor stretches the desert of Gobi. The population are in the main Turkish (the Kara-Kirghiz of the Tian-Shan and the Uigurs are among the purest representatives of this stock), though a vast admixture of other elements has taken place in the course of ages—e.g. Persians, Arabs, Tibetans, and Chinese, to say nothing of Mongol and other Tartars. The inhabitants dwell mostly in the west, and in chains of towns and villages along the northern edge of the desert. The chief town is Kashgar. This region was subject to princes of the Jagatai House (Turco-Tartar) from the time of Jenghiz Khan (1218) till it was taken by China in 1758; from 1864 to 1877 the dominion was wrested from China by Yakub Beg, but at the latter date the Chinese recovered it. Quite recently Dr. Sven Hedin and Dr. Stein have discovered on the southern edge of the Takla-makan desert evidences of ruined cities and an ancient civilization going back to the 4th or 3rd century B.C., and the former explorer has discovered north of the existing Lob Nor traces of the ancient state of Lou-lan, or Shen-shen, dating from the 3rd century B.C.

Turkestan, RUSSIAN or WESTERN, a name sometimes applied to the whole of Russian Central Asia, but officially to the provinces of Syr Daria, Samarkand, Fergana, Semirychensk, and Transcaspiä. In the latter sense Russian Turkestan has an area of 623,651 sq. m., and a population (1897) of 5,260,406. It comprises all Asia between the Caspian, the Tarbagatai hills, the Tian-Shan, the E. and S. of the Pamir, and the N. frontier of Afghanistan and Persia (except only for Bokhara and Khiva). The rivers which principally drain this region are the Amu Daria (Oxus), Syr Daria (Jaxartes), and Zerafshan. The western portion consists of desert (Kara-kum and Kizil-kum); the eastern is mountainous, being invaded by the Trans-Alai, Alai, Alexander Mts., and other offshoots of the Pamir. The mineral wealth is considerable, and includes copper, gold, lead, silver, iron, coal, naphtha, sulphur, asphalt, ozokerite, gypsum, salt, clay, and various gems, especially turquoises and beryls. The population consists of four principal groups—(1) Turkish, (2) Iranian, (3) Russian, (4) other immigrants. The first, the most important, consists of Uzbeks (2,000,000), Kirghiz (3,100,000),

Turcomans (500,000), and Kara-Kalpaks (50,000). The South Arayan or Iranian population (Tajiks, Sarts, and Persians) numbers about 1,000,000; the North Arayan or Slavonic (Russians, etc.) about 100,000, including 60,000 troops. These figures include the khanates of Bokhara and Khiva.

Turkestan, the eastern division of Afghanistan. Its northern provinces are well watered and fertile; prolongations of the Hindu-Kush range of mountains are spread over its southern districts. Exports: rock salt, hides, camel's hair, carpets, and many varieties of fruit. Few Europeans have found their way into these regions. A mixed population of Turks, Persians, Arabians, and Afghans are successful camel and horse breeders, and profess Mohammedanism.

Turkestan (Hazret-i-Turkestan), tn., Syr Daria prov., Russian Central Asia, 150 m. N.N.W. of Tashkend. It has a citadel, and is a centre of Mussulman pilgrimage. In the neighbourhood are extensive ruins, supposed to represent the ancient Talas or Taras. Pop. (1897) 11,592.



Turkey.

Turkey (*Meleagris*), a genus of American game-birds, including only two species. The domesticated form is derived from *M. gallipavo*, which in the wild state extends from the south of Canada to Mexico, through the eastern and south-western states. The head and neck are reddish in colour, nearly bare of feathers, and covered with a wrinkled, warty skin. The head bears a pendent erectile process, and the male has a strong spur, as well as a curious bunch of black bristles on the chest. The plumage, generally, is bronze, with a metallic sheen and black markings. The tail in the male is capable of being erected, and the bird at the same time utters a peculiar gobbling noise. The turkey is polygamous, the males fighting fiercely at the pairing season. The eggs are laid in a hole scraped in the ground and

lined with leaves, and number from eight to twenty. After the breeding season the sexes separate, the females going about in small flocks with their young. The food is very varied, and is sought upon the ground; but the birds roost high up in trees. They are exceedingly wary and quick of foot; but the wings are short, and the power of flight is not great. Turkeys were first domesticated in Europe at the beginning of the 16th century. They are considerably less hardy than the common fowl, the young especially being very sensitive to damp. In England, the counties of Norfolk and Cambridge are specially famous for their breeds of turkeys. The other species of turkey is *M. ocellata* of Yucatan, British Honduras, and Guatemala, a smaller bird, with much more brilliant plumage. The tail has beautiful 'eyes' like those of the peacock. The breast tuft is absent in this species. Turkeys belong to the family Phasianidae.

Turkey, or OTTOMAN EMPIRE, includes the regions enumerated in the table given on the following page.

The present article deals only with Turkey in Europe—that is, the provinces of Adrianople, Macedonia, and Albania. The mountain system of the Balkan peninsula may broadly be divided into three chains—(1) the Balkans, extending from Vale of Timok eastwards to Cape Emine on the Black Sea, forming the watershed between the Danube and the Ægean; (2) Pindus, forming the watershed between the Ægean and Ionian Seas; (3) the Illyrian system (Shar-dagh), extending from N.W. to S.E., parallel with the Adriatic. Alluvial plains lie between the mountains and the Ionian and Adriatic Seas. Between the Struma and the Maritza the Rhodope range rises to a height of 6,500 ft. The Maritza is practically the one navigable river. This and most of the other considerable rivers—e.g. the Kara-su or Mesta, Struma, Vardar, and Vistritza—fall into the Black Sea; while the Viosa, Semeni, Shkumbi, and Drin enter the Adriatic. The chief lakes are those of Skutari, Okhrida, Janina, Prespa, and Takhyno. The climate is Mediterranean, with subtropical rains and summer droughts. Temperature is very variable, and owing to the bitter north-east wind is colder than that of Italy or Spain, which are in the same latitude. Chief town, Constantinople. The Osmanli, or Ottomans, the ruling though by no means the most numerous race, are a handsome, courageous, honest, and dignified set of men; but, at the same time, indolent,

fanatical, superstitious, and arrogant. They obstinately resist the influences of European civil-

ties, subject to the confirmation of the Porte. The Armenian Church also has its patriarch at

and cabbages are the chief vegetables. Plums also form an important article of export. Olives abound in Thrace and S. Macedonia. Vines are everywhere cultivated, and the export of wine has very considerably increased since 1892. Tobacco is also largely cultivated. Trade and industry are much impeded by want of means of communication: all the roads are bad. Armenians and Greeks are the chief bankers. The total exports amount to about £14,000,000 annually, and the total imports to £22,000,000. More than a third of the total trade falls to Constantinople. The Turkish empire is an absolute monarchy, under the Sultan or Padishah, who, being also Khalif, unites in his own person the highest secular and spiritual authority. The Sultan exercises his power through the Grand Vizier, who is the president of the council, and the Sheik-ul-Islam, who is the head of the Ulemas. The Grand Vizier, the Sheik-ul-Islam, and the various ministers form together the Divan. The reforms of 1896 for admitting the Christians to some share in

	Area in square miles.	Population.
<i>Turkey in Europe.</i>		
Macedonia, Albania, etc.	65,350	6,130,200
Bulgaria	37,200	3,744,300
Crete	3,330	310,400
<i>Turkey in Asia.</i>		
Samos	180	54,840
Asia Minor	193,540	9,089,200
Cyprus	3,710	237,000
Armenia and Kurdistan	71,990	2,470,900
Mesopotamia	143,250	1,398,200
Syria	114,530	2,890,400
Arabia	170,300	1,050,000
<i>In Africa.</i>		
Tripoli	398,900	1,000,000
Egypt	400,000	9,821,100
Total	1,602,280	38,196,540

zation. Polygamy is confined almost entirely to the rich classes. The chief religions of Turkey are the Mohammedan and the Greek

Constantinople; while the Roman Catholics have nine archbishops in the Turkish empire. Education is at a low level;



Catholic. The adepts of the study of the Koran, the Ulemas, decide all doubtful cases relating to religious and social life, and can fill the judicial as well as the ecclesiastical posts. The patriarch of Constantinople presides over the permanent synod, and nominates all the lesser digni-

ties, but there are an imperial lyceum at Galata-Sarai, and various technical colleges in the capital. The best and most important schools are the Greek and Armenian. Agriculture is very backward. The vilayet of Adrianople is the granary of Turkey. Onions, leeks, gherkins,

the provincial government remain a dead letter. General conscription has obtained since 1880. The total period of service is from twenty to forty years of age. The army is divided into seven army corps, and in time of war nearly a million men could be put in the field. The navy consists of 6

cruisers (2 modern) and several smaller vessels.

History.—The Turks first appear in European history in the middle of the 14th century. Driven by the Mongols from Central Asia to Armenia, and extending their domain gradually westwards into Asia Minor, they derived their name of Osmanlis (corrupted to Ottomans) from the first Sultan, Osman (1258-1326), whose son Orkhan (1326-59) made his capital at Brusa, opposite Constantinople. Orkhan's son Solyman captured (1358) Gallipoli, whereby the Turks first gained a footing in Europe, and Murad I., or Amurath

(1421-51) Turkey again became an aggressive power, though repeatedly held in check by the Hungarian regent John Hunyadi and the Albanian chieftain George Castriot, better known as Scanderbeg. With the capture of Constantinople (May 29, 1453), however, by Mohammed II. (1451-81), the fate of the Balkan peninsula was sealed, and Hungary herself was saved only by the crowning exploit of Hunyadi, the defence of Belgrade (1456), and the subsequent firm and judicious policy of his son, Matthias I. Peloponnesus was conquered in 1456, Albania in 1470, the Crimea in 1474, and Moldavia in

man aggression was received beneath the walls of Vienna in 1529. On the other hand, the Sultan won possession of Algeria and the north coast of Africa to the east, and made himself master of the Mediterranean, being successfully resisted only at Malta by the Knights of St. John. Under Selim II. (1566-74), who left his generals to fight his battles, the grand vizier conquered Cyprus and many of the Ionian Is.; but the battle of Lepanto (Oct. 7, 1571) taught Europe that the Turk was not invincible. The decline of the empire was everywhere visible under the three feeble Sultans Murad III. (d. 1595), Mohammed



Group of Turks.

(1359-89), established the capital of his empire at Adrianople, reduced the Byzantine empire to the narrow limits of Constantinople, and defeated the Servians and their allies at the great battle of Kossovo, or the Field of Blackbirds (June 15, 1389), though he himself perished on the field. Bajazet I. (1389-1402) subdued Walachia, Bulgaria, Thessaly, and Macedonia; annihilated the combined hosts of Hungary and Poland at Nicopolis (Sept. 28, 1396); but was himself defeated and taken prisoner by the Mongol Timur at Angora in 1402. Mohammed I. (1402-21) re-established the empire, and under Murad II.

1478. The reign of Bajazet II. (1481-1512) was pacific, and the cruel Selim I. (1512-20) devoted all his military energy to the subjugation of S.W. Asia and N. Africa; but it was under Solyman or Suleiman II. (1520-66) that the Osmanli empire reached its utmost limits and became a terror to Christendom. In 1521 he captured Belgrade, the key of Hungary; Rhodes fell in 1522; and two years later the bloody battle of Mohács (Aug. 29, 1526) was the grave of Magyar independence for nearly two hundred years, and the central portions of Hungary became a Turkish province. The first check to Otto-

III. (d. 1603), and Ahmed I. (d. 1617), notably in Persia and in Hungary, where the Transylvanian princes Stephen Bocskay and Bethlen Gabriel materially assisted the emperor against the common foe. With Mohammed IV. (1648-87) a more glorious era began, chiefly owing to the genius and energy of the Grand Vizier Mohammed and his son Ahmed Köprili; but their only territorial acquisitions were Crete, Podolia, and part of the Ukraine. Vienna was vainly besieged a second time in 1683, and after a ruinous war with the emperor, Mustapha II. (1695-1703) was obliged to conclude the humiliating peace of

Carlowitz, whereby the Porte relinquished all Hungary except the Banat, besides ceding Morea to Venice, Podolia to Poland, and Azov to Russia. Ahmed III. (1703-30), the contemporary of Peter the Great, was the first to feel the pressure of the northern colossus, though he won back Azov from Russia. On the other hand, his Austrian wars were disastrous, and the victories of Prince Eugene extorted the peace of Passarowitz (1718), whereby Turkey relinquished Little Walachia and a considerable portion of Bosnia and Servia, including Belgrade, to Austria. An almost exact reversal of this convention was the treaty of Belgrade (1739). A

repeated reverses undermined the authority of the government, and led to numerous rebellions and civil war, in the course of which the Sultans Selim III. (1807) and Mustapha IV. (1808) were murdered. Mahmud II. (1808-39) energetically endeavoured to restore order by annihilating the janissaries (1826), and reforming the army on a European model; but his cruelties against the insurgent Greeks raised all Europe against him. The Turkish fleet was destroyed at Navarino (1827), and the victorious Russians advanced as far as Adrianople, where (Sept. 14, 1829) peace was concluded, whereby the special privileges of Servia and the Da-

war. Another war with Russia arose in 1853, in consequence of the Porte's refusal to yield to the dictation of the Emperor Nicholas in the matter of the so-called privileges of the Orthodox Christians in Palestine, when the Turkish army displayed unexpected capacity, and tenaciously defended itself on the Danube, while the western allies of the Sultan successfully encountered Russia in the Crimea. Great things were at first anticipated from Sultan Abdul Aziz (1861-76); but after the deaths of his able ministers, Fuad and Ali Pashas, a period of reckless extravagance began, which ended in national bankruptcy in 1875. Moreover, the



A Turkish Market-Place.

second war with Russia alone, which lasted from 1768 to 1774, and was caused by a just suspicion of Russia's designs on Poland, was disastrous, though not territorially expensive; for the Porte, by the treaty of Kuchuk-Kainardji (1774), only lost the Kuban district and a few other places in S. Russia. In a renewed attack upon Turkey by Austria and Russia thirteen years later, undertaken with the intention of dismembering the Ottoman empire, Austrian incapacity again neutralized the triumphs of Russia won by Suvorov (Suwarow) and Repnin; yet by the peace of Jassy (1792) Turkey parted with the Crimea and all her South Russian possessions. These

nubian principalities, and the complete independence of Greece, were recognized by the Porte. The endeavours of the Sultan to strengthen his empire by a more rigorous centralization only ended in the loss of Egypt, and on the accession of his son Abdul Medjid (1839-61) the empire was only saved from Mehmet Ali of Egypt by the armed intervention of the western powers, for which Abdul Medjid paid by the famous edict (*hatti-sherif*) of Gülhane (Nov. 3, 1839), which granted equal rights to all the subjects of the Porte, and introduced many salutary reforms; and by the treaty of London (1841), which closed the Bosphorus and the Dardanelles against ships of

influence of Russia again became paramount, and it soon became evident to the Turkish nation that Russia was aiming at the destruction of the state, and that the Sultan and the grand vizier were her creatures. The deposition of Abdul Aziz (May 30, 1876) and the elevation of Murad V. were the final results of this conviction, and simultaneously a war of extermination burst forth, instigated by Russia, against the Mohammedans of Bulgaria. The Bulgarian insurrection was, however, suppressed, and Servia (independent since 1862), who chose this moment treacherously to attack her suzerain, was saved from annihilation only by the direct intervention of Alexander II.

(Oct. 30, 1876). Meanwhile the imbecile Murad V. had been superseded by his brother Abdul Hamid II. (Aug. 31), and England proposed a conference for the purpose of providing for the administrative autonomy of the Balkan provinces, whilst preserving the integrity of the Ottoman empire. At the meeting of the conference at Constantinople the grand vizier, Midhat Pasha, proclaimed a liberal constitution for all the subjects of the Porte without exception—a skilful counter-check to Russia's panslavic intrigues, though possibly never intended to take effect. But the conference itself proved abortive, and Russia, having now completed her military preparations, declared war against the Porte (April 24, 1877). The Russians, however, repeatedly defeated at Plevna, were obliged to solicit the Roumanian alliance and bring up their last reinforcements. The Turks were forced at last to yield to numbers, and submit to the peace of San Stefano (March 3, 1878), whereby they recognized the absolute independence of Roumania and Servia, consented to the aggrandizement of Servia and Montenegro, to the erection of an autonomous Bulgaria, and ceded the Dobruja. The energetic intervention of England, however, who sent a fleet to the Sea of Marmora in order to abate the pretensions of Russia, led to a peace congress of the powers at Berlin (June 13 to July 13, 1878), for the purpose of regulating the whole Eastern question. The congress limited autonomous Bulgaria to the North Balkan district, the southern portion of the land being erected into a province (E. Roumelia) under Turkish suzerainty. Austria was at the same time authorized to occupy Bosnia and Herzegovina, despite the protests of the Porte; and Greece also was allowed advantageously to rectify her frontiers. On July 3, 1881, the Porte was further compelled to cede almost the whole of Thessaly and Arta in Epirus to Greece. In 1880 German officers undertook the reorganization of the Turkish army, and drafted military regulations for the whole empire, which came into force in 1887. For the next ten years the Porte prudently adhered to a strictly pacific policy, despite considerable aggravation from Greece and Bulgaria (Prince Alexander united E. Roumelia to his principality in 1885, and the Sultan accepted the fact without a protest); but he kept up a large army in view of contingencies, and its efficiency was at once apparent when, in April 1897, Greece wantonly provoked the Turks to open war. Edhem Pasha easily defeated the Greeks, and in a

few weeks' time occupied the whole of Thessaly; and Greece was only saved from the effects of her folly by the powers (peace of Constantinople, Dec. 4, 1897). In quite recent times the multitudinous abuses of the Turkish government have excited much patriotic discontent, and given rise to the formation of a so-called 'Young Turk' party, embracing many of the most enlightened officials. The government (notably in spring 1901) has treated them simply as rebels, and ruthlessly suppressed them. Still more recently the agitation in Bulgaria for 'the liberation' of Macedonia has caused the Porte much trouble, including a naval demonstration by the powers in 1905. See Bérard's *La Turquie et l'Hellénisme contemporain* (1893); Mitchell's *The Greek, the Cretan, and the Turk* (1897); Driault's *La Question d'Orient depuis ses Origines* (1898); La Barre de Nanteuil's *L'Orient et l'Europe depuis le XVII. Siècle* (1898); Salmone's *The Fall and Resurrection of Turkey* (1896); Poole's *Turkey* (1888); Broadhead's *Slav and Moslem* (1894); Choublier's *La Question d'Orient depuis le Traité de Berlin* (1897); Bérard's *La Politique du Sultan Abd. Al-Hamid II.* (1897); Lusignan's *The Reign of Abdul Hamid II.* (1876); Moltke's *Briefe über Zustände in der Türkei* (1891); and Brailsford's *Macedonia* (1906).

Literature.—The Ottoman Turks derived their culture from the Seljuk Turks, who preceded them in Asia Minor. Turkish literature thus became, so to speak, a branch of Persian literature, though written in the Turkish language. The two most salient features of Persian and Turkish poetry are mysticism, expressed chiefly through a subtle blending of celestial and human love, and a passion for verbal artifice. Almost all Turkish writing that is purely literary in aim is in verse. Thus an artistic style in poetry was developed much earlier than a good prose style, and was cultivated with much greater assiduity; and until we come to the middle of the 19th century we meet with comparatively few prose works that can be read with pleasure merely on account of their style.

When Turkish literature began at the dawn of the 14th century, the dominant influence in W. Asia was that of the Persian mystic Jelalud-Din Rumi (d. 1273). Sultan Veled, the son of this man, was the first West Turkish poet. He was followed by a number of other mystic poets or versifiers, the most noteworthy being Ashik Pasha (d. 1332). The language of these men is necessarily rude: Turkish as a written

speech was still in its infancy. But after Timur's invasion, at the beginning of the 15th century, Turkish poetry became much more refined and much more Persianized. The poet Ahmedi (d. 1413) is an example: his *Iskander* romance, a legendary history of Alexander the Great, and the earliest Turkish romance, which was composed before Timur's invasion, is written in a very homely style; while his lyrics, mostly the work of his later years, are thoroughly Persian, both in diction and in sentiment. Sheikhî (d. c. 1440) introduced the artificial style into the metrical romance in his *Khusrev and Shirin*, a poem on an episode in old Persian history. The best lyric poet of this time is Nesimi (d. 1417), a follower of the historical sect called Hurufî, who was executed for too free expression of his heterodox views. This period, which may be styled the first or formative age in the history of Ottoman literature, closes about the middle of the 15th century, when the influence of the poets of the Persianized court of Herat, notably of Jami (d. 1492) and Mir Ali Shir or Nevayi (d. 1500), begins to dominate Turkish letters. Turkish poetry of this second period is distinguished by a pronounced tendency to run into allegory, and by the extraordinary attention paid to rhetoric. The earliest poet of the new style was Ahmed Pasha (d. 1496), one of the viziers of Sultan Mohammed II.; but he was surpassed by Nejâti (d. 1508), Meshî (d. 1512), and others. The school culminated in Baki (d. 1600), whose lyrics are unrivalled in ingenuity and elegance; but the truest poet was Fuzulî (d. 1555), who, though he could not wholly escape from the artificialities of his age, is perhaps the greatest master of pathos in Turkish literature. Lami'i (d. 1531) is the most prolific of the romanticists, having left no fewer than seven works of this class; but Fuzulî, though he wrote only one, is the greatest poet among them. It is only now that Turkish prose becomes of any account. Sinân Pasha, another vizier of Mohammed II., composed a devotional work, *Tazarru - Nameh*, in a singularly beautiful and noble yet simple style. His successors, though more lavish with decoration, did not improve on him. Among the best and most typical examples of the prose of this time are Ali Chelebi's (d. 1499) version of the *Fables of Bidpai* (Pilpay) and Sad-ud-Din's (d. 1599) history of the empire entitled *Tâj-ut-Tevârikh* (Crown of Chronicles).

With the dawn of the 17th century another period begins. The models are now the Persian

Urûî (d. 1590) and Faidî (d. 1595), and the chief feature of the style fashioned on them is the substitution of eloquence, or rather grandiloquence, for rhetoric. The greatest poet of the school is Ne'î (d. 1634), whose panegyrics are masterpieces of literary pagantry; but his satire involved his execution. In the second half of this century the versatile poet Nabi (d. 1712) introduced the literary methods and didactic tone which the Persian Sâ'ib (d. 1677) had recently made prominent in the poetry of his country. The contemporary poet Sâbit (d. 1712) made a strenuous effort to stem the Persian torrent and render Turkish poetry more national in both language and sentiment. About the same time the picturesque but fantastic verses of another Persian poet, Shankat of Bokhara (d. 1695), became popular in Turkey.

The fourth period extends from the beginning of the 18th to the middle of the 19th century. The Turkish revolt arising from Sâbit's innovations resulted about the middle of the 18th century in its temporary triumph. The best writer of the earlier time is the poet Nedim (d. 1730), whose verses are remarkable for grace and daintiness. The most characteristic writers are, however, the poets Sunbul-zadeh Vehbi (d. 1809) and Fâzil Bey (d. 1810), the humorist Kâfî (d. 1791), and the poetess Fitnet (d. 1780). In the beginning of the 19th century the national Turkish influence was replaced by an artificial resuscitation of the old Persian style. Sheik Ghâlib (d. 1798) is the greatest poet of this epoch; his allegory *Husn-u Ashk* ('Beauty and Love') is in some respects the finest poem in the language. But this Persian reaction produced no great writer, and towards the middle of the century it was superseded by the new school of Turkish literature, modelled on the literature of Europe. The writer who first clearly struck the new note was Shinâsî Effendî (d. 1871). He was ably seconded by a number of talented and energetic disciples, chief among whom was Kemâl Bey (d. 1888), one of the most gifted men of letters Turkey has produced.

The appearance of this new school has introduced the fifth period of Turkish literature; it is a result of the study of French. Abdul-Hakk Hamid Bey, who was the first to apply the European style to Turkish poetry, is the author of many fine poems and dramas (the last a form of literature introduced by the new school), and is by general consent the greatest living Turkish poet. His lead was followed with much success by Ekrem Bey, who

stands very high in the literary world of Constantinople. Within recent years a band of young poets, the most prominent of whom is perhaps Tewfik Fikret Bey, have moulded the Turkish language into an instrument capable of expressing or suggesting the subtlest shades of thought. Prose, too, has been quite revolutionized, Kemâl Bey leading the way. See Von Hammer-Purgstall's *Geschichte der Osmanischen Dichtkunst* (4 vols. 1836-8), E. J. W. Gibb's *A History of Ottoman Poetry* (1900), and G. Jacob's *Türkische Literatur* (1900).

Turkey-buzzard. See VULTURE.

Turkey Red. See ALIZARIN and DYEING.

Turkmanshai, vil., Azerbaijan, Persia, 64 m. E.S.E. of Tabriz. In 1828 a peace was concluded here between Persia and Russia, by which the latter acquired a great part of Armenia.

Turkomans, or TURKMENIANS, a branch of the Turki race, forming the bulk of the population in Western Turkestan (the Russian province of Transcaspia) and N. Persia (Khorassan, Azerbaijan). Total pop. (1902) about 1,200,000. The Turkomans are usually regarded as an offshoot of the Uzbeks, who penetrated to the Caspian region in the 14th century. But here they met, and no doubt absorbed, the descendants of the ancient Parthians, besides many Tajik (Persian) groups. They are still mostly nomad shepherds, and all are Mohammedans, chiefly of the Sunnite sect. See V. Baker's *Clouds in the East* (1886), Vambery's *Travels in Central Asia* (1863), and H. Weil's *La Tourkménie et les Tourkmènes* (1880).

Turks. See TURKEY.

Turk's Cap, or MELON CACTUS, a succulent plant belonging to the order Cactaceæ. See MELO-CACTUS.

Turk's Islands. See CAICOS.

Turmeric is derived from the rhizome of various species of *Curcuma* growing in China, India, Java, Barbados. The roots are hard and resinous, and when ground yield a yellow powder with a well-marked aromatic odour. The distinctive principle of turmeric is a colouring matter, curcumin, which crystallizes from alcohol in yellow prisms, and from its property of being turned brown by alkalis and boric acid has some employment as an indicator. Turmeric has some application as a dye, but is not fast to light; it is also used as a condiment in curry powder.

Turn, tn., Bohemia, Austria; a northern suburb of Teplitz. Pop. (1900) 12,405.

Turnberry Castle, ruin, w. coast of Ayrshire, Scotland, on

the Firth of Clyde, 6 m. N. of Girvan; disputes with Lochmaben the honour of being the birth-place of Robert the Bruce. One mile to the E. is Shanter farm, immortalized by Burns in *Tam o' Shanter*.

Turnbull's Blue, a pigment produced by the action of a ferrous salt on potassium ferricyanide. Its composition corresponds to $\text{Fe}_5(\text{CN})_{12}$, and in properties it closely resembles Prussian blue, though of somewhat lighter shade.

Turnebus, ADRIEN (1512-65), originally named Tournebois, French classical scholar, born in Normandy, and became professor of Greek at Paris in 1547. He acquired a European reputation, translated into Latin a number of Greek authors, including Plutarch and Theophrastus, and wrote commentaries on Cicero's works. See Passeray's *In Turnebi Obitum Nænia* (1651).

Turner, CHARLES TENNYSON. See TENNYSON, CHARLES.

Turner, JOSEPH MALLORD WILLIAM (1775-1851), English landscape painter. His inner life was a genius-fed, unflagging devotion to art—an art rising from and sustained by high ideals, informed by a passion for beauty, built on a basis of extraordinary observation, of ceaselessly acquired and intuitive knowledge. Much has been written of the meanness, the sensuality of his life. But so little is known of his private affairs that too much has been deduced from scanty facts, too little from the obviously robust, nervous constitution, and habit of mind and physique, that could produce such a quantity of work of such high quality. If his extraordinary genius was ill-mated to his body, if he was heedless of personal environment, if he was expressively dumb to all but one supreme direction, sensitive to misunderstanding and hostile criticism (especially in his later life), at least he was ever loved by children and generous to those in distress; he designed his fortune of £140,000 to endow an institution for the assistance of poor artists, and bequeathed the bulk of his work to the nation—three hundred and sixty-two pictures and nineteen thousand drawings. A boy of exceptional promise—the son of a barber in Maiden Lane, London—he learned to draw from every chance opportunity—in the market-place, the shipping below London Bridge; copied drawings from old masters belonging to a Dr. Munro; and owed much to his friendship with Girtin, the water-colourist. He made topographical drawings for guide books and almanacs. In 1789 he began to paint in oils, entered



A Picture by J. M. W. Turner, R. A. 'Italy: Childe Harold's Pilgrimage.'
In the National Gallery, London.

at the Royal Academy schools, exhibited in 1790. A visit to Yorkshire in 1797 was a turning-point in his development. In 1799 he was elected A.R.A., R.A. in 1802, and professor of perspective in 1803. In 1812 he built himself a house at 47 Queen Anne Street, w., and another at Twickenham in 1814. His work is divisible into four periods:—1800-20, when he learned through the eyes of predecessors (Claude, Poussin, Vandevelde), and painted topographically in gray-greens and browns. From 1820-35 he worked on principles he had discovered, and in 1802 a sunset on the Rhine taught him more than all the schools. He drew delicately transcripts from nature, the sky, and clouds, as well as earth and trees; his passion for expression through colour developed with the desire to suggest the richness, 'the great fact of quantity,' in the universe. In 1835-42, his mature period, he is the apostle of light: by his marvellous chromatic use of brilliant colour he endeavoured to paint sunlight, aerial and atmospheric effects, by methods that anticipate Monet and his followers. To the last, even when sight was impaired, Turner continued to be the experimenter, more in love with witcheries of light and colour in nature than with any acquired style of work. Thus, even at his best period he is unequal. Lack of sympathy, hostile misunderstanding, and spiritual isolation drove him at times into extravagances and lack of sane balance through very bitterness of heart. He died in a miserable lodging, with the setting sun shining upon his face; and almost his last words were, 'The sun is God.' See Thornbury's *Life of Turner* (1862); Ruskin's *Modern Painters* (new ed. 1897); Monkhouse's *Notes on the Turner Gallery* (1878), and *Turner, in the Great Artist Series* (1879); Sir W. Arnstrong's *Turner* (1901); and Wyllie's *Turner* (1905).

Turner, SHARON (1768-1847), English historian, was born in London. Although an attorney by profession, he carried on valuable researches among original Icelandic and Anglo-Saxon MSS. In 1805 he published the first volume of his *History of England*, completed in 1839. He also wrote *Sacred History of the World* (1832).

Turner, SIR WILLIAM (1832), surgeon, was born at Lancaster, England. In 1854 he was appointed senior demonstrator in anatomy at Edinburgh University, the school to which his life-work has been devoted. On Goodsir's death in 1867 Turner was appointed to the chair—a position he vacated only in 1903, on his election to the

principalship of the university. He was knighted in 1886. His skill and success as a teacher, and his power of organization, demand as high praise as his purely scientific work.

Turnhout, tn., prov. Antwerp, Belgium, 25 m. E.N.E. of Antwerp; has manufactures of playing cards, lace, cotton, linen, and leather goods. Leech-breeding is carried on. Near it in 1597 Prince Maurice of Nassau defeated the Spaniards. Pop. (1900) 20,887.



Inflorescence of Turnip (*Brassica campestris*).

1, Flower, petals removed; 2, seed-vessel.

Turnip. Both *Brassica rapa*, or common turnip, and *B. campestris*, or Swedish turnip, belong to the same genus as cabbage, rape, kale, and kohlrabi. The white swede is a green-topped, green-skinned, white-fleshed root of great hardihood. The swede turnip is hard, yellow, crisp, and sweet in flesh, and capable of resisting any ordinary frosts. It requires fairly good land, and is possessed of excellent keeping properties and high nutritive quality. It is chiefly used during late winter and spring. Yellow turnips occupy a middle position between swedes and white turnips. Soft or white turnips are less capable of resisting frost, will thrive in poor, thin soils, and are considered most useful in autumn and early winter. Although both sheep and cattle will fatten on turnips and straw, or turnips and hay, these roots are not fitted for being used without dry fodder. Wherever soils are benefited by the close-folding of sheep during winter, turnip

husbandry is considered to be an important feature; but where the land is injured by treading or carting off, turnips are not desirable. The crop is very dependent upon the season. The climate must be moist to secure a full crop, and hence it is in the north of England, Ireland, and Scotland that turnip cultivation is most successfully pursued. Turnip cultivation is in less favour upon the continent of Europe than in Great Britain.

Turnpike Roads, roads which were vested in trustees by acts of Parliament, with power to levy tolls for their upkeep. The system was found inconvenient, and the trusts have all come to an end; but roads in England which have been disturnpiked since 1870 are, by the Highways and Locomotives (Amendment) Act, 1878, declared to be main roads, and the cost and management of them now fall on the county councils.

Turnsole, an old name for the heliotrope.

Turnstone (*Streptopelia interpres*), a small littoral bird, allied to the lapwings, and a regular visitor to British shores. It usually arrives in August, and may stay through the winter. The bird is nine inches long, and in its breeding plumage is beautifully marked. The head, rump, tail, and wing quills are black and white, the upper parts chiefly black and chestnut, the breast black, and the rest of the under parts white. In autumn the chestnut markings are less conspicuous. Turnstones breed chiefly in the far north. The food consists chiefly of small crustaceans and molluscs, obtained by turning over seaweed and small stones,



Turnstone.

whence the name. The nest is a hollow near high-water mark, the eggs being four in number, and gray-green in colour, marked with brown. Another species, *S. melanocepalus*, is found on the Pacific coast of N. America.

Turnus, in ancient Latin legend, king of the Rutulians in Italy; his town was Ardea. When Æneas arrived in Italy, and obtained from King Latinus the promise of his daughter Lavinia's hand, Turnus, to whom she had been betrothed, declared war against the invading Trojans, but was killed by Æneas. See Virgil's *Æneid*.

Turnu-Severin, tn. and river port, co. Mehedinți, Roumania, on the l. bk. of Danube, 64 m. W.N.W. of Craiova. It exports grain, salt, and petroleum. There are the remains of a bridge built by Trajan, and of a town erected by Alexander Severus. Pop. (1899) 18,626.

Turpentine, the resinous exudation of various Conifera, that from *Pinus australis* (American turpentine), *Pinus pinaster* (French), *Pinus sylvestris* (Russian), and *Pinus larix* (Venice) being the most popular. On distillation by fire, heat, or steam, 'oil' or 'spirit of turpentine' passes off, leaving colophony or resin. The volatile portion consists mainly of terpenes, having the formula $(C_5H_8)_n$, and differing mainly in behaviour towards polarized light: for example, American turpentine is dextro-rotatory and French levo-rotatory. Oil of turpentine is a colourless liquid of characteristic odour. It boils at about $160^\circ C.$, and is a good solvent for oils and resins, being used for this purpose in the preparation of paints and varnishes, except in the case of Russian turpentine, which does not dry properly. Oil of turpentine is used in medicine for external application as a rubefacient and counter-irritant, and internally to a small extent to check bleeding, but is apt to have a dangerous effect on the kidneys.

Turpin, TULPIN, or TILPIN (d. c. 794), archbishop of Rheims for more than forty years. He encouraged literature, and is credited with the composition of a chronicle of Charlemagne and Roland, one of the grand sources of the tales of chivalry of the middle ages. It was translated from Latin into French in 1206-7. The original first appeared in the collection of Schardius (1566), and Ciampi printed an edition at Florence (1822). See Gaston Paris's *De Pseudo-Turpino* (1865).

Turpin, DICK (1706-39), English highwayman, was born at Hempstead in Essex. In early life a butcher's apprentice, he became an associate of Tom King, whom he afterwards accidentally shot. The famous ride from London to York, generally attributed to Turpin, was accomplished in all probability by another highwayman, Nevison ('Nicks'), who, having committed a robbery at

Gad's Hill (Kent) at 4 a.m., appeared in York that same evening at 7.45 p.m., thereby establishing an *alibi*. Turpin was hanged at York.

Turquoise, also known as CALAITE, $Al_2(OH)_2PO_4H_2O$, is a precious stone (h.=6, sp. gr. 2.7), which has a fine sky-blue colour, but very frequently is greenish, and is then of less value. Dark-blue stones also occur, but most of them are artificially coloured. The mineral often turns white on weathering, and may also lose its colour by exposure to light. It is opaque or translucent, and never occurs crystallized. In Persia,

Türr, STEPHEN (1825), Hungarian patriot and general, was born at Baja. Joining the Italian army (1849), he fought against the Austrians. In the Crimean war he served with the British against Russia, and was afterwards tried as an Austrian deserter and condemned to be shot—a sentence which was not carried out owing to the strong remonstrances of the British government. Under Garibaldi he distinguished himself in the liberation of Sicily (1860). Having become a general, he quitted the Italian service in 1867. To Türr is due the credit of the



A Turpentine Farm—Dippers and Chippers at Work.

(Photo by Underwood & Underwood.)

Turkey, Arabia, and the Levant, also Russia and India, it has long been in very high favour. The principal mines are at Nishapur in N. Persia. It is found also in Sinai, New Mexico, Arizona, and other parts of western N. America. Turquoise is also made artificially by subjecting a powder of the right composition to great pressure; the artificial stones are small and not durable. Bone-turquoise, or odontolite (also known as Occidental turquoise), is fossil bone, covered with a blue incrustation, obtained principally from the Miocene deposits of Simorre in France.

construction of the canal through the isthmus of Corinth (1893). See *Life* by Schwartz (1868).

Turret, in naval architecture, a small armoured tower, wholly covered in and capable of being revolved. It contains one or more guns, which project through ports in the armour. The first ship fitted with a turret was the American Federal vessel *Monitor*, built after Ericsson's plans in 1862. The first British vessel to be fitted with turrets was the *Royal Sovereign*, in 1862-4. Since about 1890 turrets have been generally superseded by barbettes. In America, however, turrets are

still favoured, and some ships there have even been fitted with one turret above another, each revolving independently.

Turretin, a Genevan family of theologians, the ancestor of which was Francesco Turretin, exiled from Lucca in 1579. He settled in Geneva, and there his son Benedict (1588-1631) became pastor in 1612, and professor of theology in 1618. Benedict's son, François (1623-87), was also professor of theology in Geneva from 1653. His *Institutio Theologiae Elencticae* (1679-85) ranks high among the strictest expositions of Calvinistic theology. The best-known member of the family was Jean Alphonse (1671-1737), son of François. He visited Leyden, Oxford, and Cambridge, and returning to Geneva became pastor to the Genevan Italians, and was successively professor of church history (1697) and theology (1705). See biographies of François and Jean Turretin by Budé (1871-80).

Turtle. See TORTOISES.

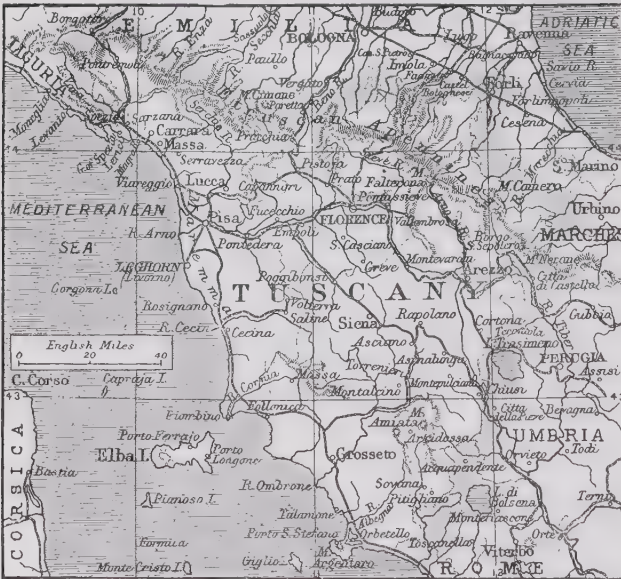
Turtle-dove (*Turtur*), a genus of pigeons, which includes a number of Old World species.

ish Islands. It reaches a length of over eleven inches, and may be recognized by a conspicuous patch of black feathers tipped with



Turtle-dove.

white at each side of the neck. The birds are shy and timid, frequenting dense woods, and feed chiefly upon seeds. The nest is composed of twigs, and



Tuscany.

In habits the turtle-doves generally resemble the true pigeons of the genus *Columba*; but their coloration is browner, and they are considerably smaller. The common turtle-dove (*T. communis*) winters in N. Africa and W. Asia, but as a summer visitor is abundant over the greater part of Europe, and nests in the Brit-

ish Islands. It reaches a length of over eleven inches, and may be recognized by a conspicuous patch of black feathers tipped with white at each side of the neck. The birds are shy and timid, frequenting dense woods, and feed chiefly upon seeds. The nest is composed of twigs, and

Tuscaloosa, city, Alabama, U.S.A., co. seat of Tuscaloosa co., 50 m. s.w. of Birmingham. The state university is here. Pop. (1900) 5,094.

Tuscan Order, in architecture, a modified Roman Doric, with unduted columns. See ARCHITECTURE.

Tuscany, a former grand-duchy of central Italy, mainly s. and w. of the Apennines. It coincided with the provinces of Arezzo, Firenze (Florence), Grosseto, Livorno (Leghorn), Lucca, Massa and Carrara, Pisa, and Siena, and covered an area of 9,304 sq. m. The Romans conquered Etruria, to which Tuscany nearly corresponded, and named it *Tuscia*. Subsequently it formed part of the kingdom of Lombardy. In the 14th century Tuscany became the centre of the revival of literature and arts. In 1569 it came under the rule of the house of Medici. In 1860 it was annexed to Sardinia, and in 1861 became part of the kingdom of Italy. Pop. (1901) 2,549,142.

Tuscaroras, North American aborigines, a southern branch of the Iroquois family, whose original territory comprised a considerable part of N. Carolina. In 1712 they migrated north, and joined the Iroquois confederacy of the Five (henceforth Six) Nations. All the surviving Tuscaroras (743 in 1900) are now settled in New York and Ontario.

Tusculum, an ancient Latin tn., close to the modern Frascati, 12 m. s.e. of Rome, on a high hill connected with the Alban Mount. It was reputed to have been founded by a son of Odysseus and Circe, and was certainly older than Rome. After its defeat at Lake Regillus in 497 B.C. it was a faithful ally of Rome until the Latin war of 340 B.C., when it joined the revolted Latins. From the settlement of 335 B.C., however, its history was that of Rome. It was a place of importance in the middle ages, under the counts of Tusculum; but in 1191 the Romans sacked it, and razed it to the ground. A fragment of the ancient citadel walls and the ancient theatre, with some ruins of the mediæval fortress, still exist. Cicero had a villa at Tusculum—hence the title of his *Tusculan Disputations*. Here Lucullus too had a villa, and a mausoleum at the entrance to Frascati is doubtfully regarded as his tomb.

Tusitala. See STEVENSON, R. L.

Tusk. See TORSK.

Tussac Grass, or TUSSOCK GRASS, a large growing hardy grass, *Festuca flabellata* or *Dactylis cespitosa*. Tussac grass is a native of the Falkland Is.,

whence it has been introduced into Scotland and other parts of Britain. It is of some value as a cattle food, and grows in great tufts, five or six feet high, with long, tapering leaves.



Tussac Grass.
1, Spikelet; 2, flower.

Tussaud, MADAME MARIE (1760-1850), exhibitor of wax figures, was born at Bern; learned in Paris the art of wax modelling, and gave lessons to Elizabeth, sister of Louis XVI., being also imprisoned for three months during the revolution. On separating from her husband in 1802, Madame Tussaud came to England, and eventually settled her waxwork exhibition in Baker Street. See *Memoirs* (1878).

Tusser, THOMAS (?1524-80), English agricultural poet, was born at Rivenhall, Essex. After being for ten years servant-musician to Lord Paget, he was for a period lay-clerk in Norwich Cathedral. His main work, *A Hundreth Good Pointes of Husbandrie* (rhymed), appeared first in 1557, and was in 1573 amplified to *Five Hundreth Pointes of Good Husbandrie united to as many of Good Huswifery*, and a metrical autobiography.

Tussilago, a genus of British plants belonging to the order Compositæ. The common colts-foot belongs to this genus, and of this plant a variegated variety is grown in gardens.

Tussock Moth (*Dasychira pudibunda*), an insect whose larva is sometimes very destructive to hops. The caterpillar is green, with transverse black markings, and has tufts or 'tussocks' of hair on most of the segments. The moth is of a grayish colour, and is about an inch long. On the Continent, where

the moth is common, the caterpillar sometimes works great havoc in forests.

Tuticorin, seapt. tn. and munic., Tinneveli dist., on Gulf of Manaar, Madras Presidency, India, 65 m. N.E. of Cape Comorin; has a missionary college. Pop. (1901) 28,048.

Tutor, in Scots law, the name given to the guardian who administers the estate and controls the person of boys under fourteen years of age, and girls under twelve. If the father is alive, he is tutor, and he has power to nominate a tutor by will. By the Guardianship of Infants Act, 1886, the same power has been conferred on the mother, if the father is dead. If no appointment is made by either of the parents, the usual course is for the court, on the application of any relative, to appoint a factor to take charge of the pupil's estate, subject to the supervision of the court, the care of the pupil's person being in the discretion of the court.

Tuttlingen, tn., Black Forest prov., Württemberg, Germany, on the Danube, 28 m. N.W. of Constance; has manufactures of cutlery and shoes, and contains the ruined castle of Honberg. Pop. (1900) 13,530.

Tvashtri, in the *Rigveda*, the Hephæstus or Vulcan of the Indian pantheon, who shaped the heaven and the earth. Among his duties were to sharpen the axe of Brahmanaspati, and to forge the golden thunderbolts of Indra.



Tussock Moth.

Tver. (1.) Government, Central Russia, bounded on N. and N.W. by Novgorod, and on S. and S.W. by Moscow and Smolensk; area, 25,225 sq. m.; pop. (1897) 1,812,825. The surface is a level plateau, containing the watershed between the Volga, W. Dvina, and Msta. Lakes and marshes are numerous. The manufactures include cheese and butter, and there are flour and cotton mills, tanneries, distilleries, glass, porcelain, and paper works. (2.) City and archiepiscopal see, capital of above, 300 m. S.E. of St. Petersburg, on both banks of Upper Volga. It has a kremlin; a cathedral (1682), containing tombs of princes of Tver; the church of the Trinity (1684); and an imperial palace, erected by Catherine II., with museum of ethnology and archæology. Tver

manufactures cotton, sailcloth and other cloths, candles, linen, cordage, hats, bells, oils, vinegar, and earthenware; has iron-foundries, breweries, distilleries, and dye-works, and is a prominent river port. In 1246 it became the capital of an independent principality. Pop. (1897) 45,644.

Twain, MARK. See CLEMENS, SAMUEL L.

Twat, the Berber name applied to the oases in W. Sahara, between 0° and 2½° E. and 26° and 29° N., but more particularly to the fertile region in the valley of the Wadi Saura. Dates, wheat, barley, cotton, and tobacco are produced. Formerly under the rule of Morocco, the oases are now included in French Algeria.

Tweed, a woollen fabric, largely manufactured in Scotland, and extensively worn by men. The name appears to be a misreading of the word 'tweel,' a term similar to 'twill,' which is generally applied to materials in which are parallel, diagonal lines over the surface of the cloth.

Tweed, the principal river of S.E. Scotland, rises at Tweedwell (1,500 ft.) in the parish of Tweedsmuir, Peeblesshire, near to the sources of the Clyde and Annan, and flows 22 m. N.E. to Peebles, descending 1,000 ft., then E. to Kelso, and finally N.E. until it reaches the sea at Berwick, after a course of 96 m. Its drainage area is 1,870 sq. m. Its main tributaries on the left are the Lyne, Eddlestone, Leithen, Gala, Leader, Eden, and Whiteadder; and on the right the Talla, Manor, Ettrick (with the Yarrow), Teviot (with the Jed), and Till. The principal towns on its banks are Peebles, Innerleithen, Melrose, St. Boswells, Kelso, Coldstream, and Berwick. It is navigable for only a few miles above Berwick. The annual value of its salmon fisheries is about £13,000. The river, and most of its tributaries, afford excellent trout fishing. See Sir H. Maxwell's *The Story of the Tweed* (1905).

Tweed, 'Boss.' See TAMMANY HALL AND SOCIETY.

Tweeddale, dist. of S.E. Scotland, the drainage area of the Tweed and some of its smaller tributaries.

Tweedmouth, seapt. tn., Northumberland, England, on r. bk. of Tweed, opposite Berwick-upon-Tweed, of which it forms a suburb. It is connected with it by a stone bridge of the time of James I. Salmon-fishing, fish-curing, iron-founding, and engineering are carried on. Pop. (1901) 3,469.

Tweedmouth, EDWARD MARJORIBANKS, SECOND BARON (1849),

English politician, sat in the House of Commons for Berwick (1880-94). He was made parliamentary secretary to the Treasury when Gladstone formed his fourth government (1892). Having succeeded to the peerage (1894), he was made, in the same year, lord privy seal, and subsequently chancellor of the duchy of Lancaster, with a seat in the cabinet. In 1905, on the formation of the Campbell-Bannerman administration, he was appointed first lord of the Admiralty.



Lord Tweedmouth.
(Photo by E. H. Mills.)

Twelfth Day, the festival of the Epiphany, being the twelfth day after Christmas, is kept as the manifestation of Christ to the Gentiles. It was formerly the occasion for festivities in commemoration of the visit of the three kings, the magi, to the infant Christ. A king (the beanking) of the feast was chosen by a bean hidden in the Twelfth Cake.

Twelve Patriarchs, TESTAMENTS OF THE, a work which, in imitation of Jacob's blessing (Gen. 49), gives dying speeches to Jacob's twelve sons. Each gives a sketch of his career, exhorts his descendants to imitate his chief virtue or to avoid his outstanding vice, and prophesies the destiny of his descendants. The book was probably written in Hebrew in the period of the Maccabees, after 200 B.C., and was afterwards translated and interpolated by a Christian about 150 A.D. See Schnapp's *Die Test. der XII. Patr. untersucht* (1884); and Charles, in *Encyclopædia Biblica*, i. pp. 237-41.

Twelve Tables, the oldest code of Roman laws, drawn up by a specially-appointed committee of decemvirs in 451-449

B.C. They were engraved on twelve copper tables, and were the foundation of Roman law, both public and private.

Twenty-four Parganas, dist. Bengal, India, including Calcutta and its suburbs. The administrative headquarters are at Alipur, a southern suburb of Calcutta. Area, 2,128 sq. m.

Twickenham, residential tn. and dist., Middlesex, England, on the Thames, $\frac{1}{2}$ m. s.w. of Richmond. Pope, Walpole, and other celebrities were associated with it. The manor-house was the residence of several dowager queens. Pop. (1901) 20,991.

Twilight, a faint illumination of the earth by sunlight reflected from the atmosphere after sunset and before sunrise. Its duration varies with latitude and season. Even within the tropics, where a sudden onrush of darkness is figuratively spoken of, twilight lasts at least an hour. But in latitude $48^{\circ} 30'$ there is no night at the summer solstice, and the number of days connected by uninterrupted twilight increases with distance from the equator.

Twill. See FABRICS, TEXTILE.
Twin Crystals, TWINNING. See MACLES.

Twinkling. See SCINTILLATION.

Twiss, SIR TRAVERS (1809-97), English political economist and jurist, was born in London, and held for a time the chair of political economy at Oxford, and later that of civil law. His *Law of Nations* (1837) is a standard work. Twiss became advocate-general, and quitted public life in 1872. Among his works are *The Black Book of the Admiralty* (1871), and *Political Economy since the 16th Century* (1847).

Tyburn. See LONDON.

Tyche, the ancient Greek goddess of fortune, who was called the daughter of Zeus. She was identified with the Roman Fortuna.

Tycho. See BRAHE.

Tye, CHRISTOPHER (? 1497-1572), English musician, was choir-boy at Cambridge. In 1553, when he published his *Actes of the Apostles*, he was attached to the Chapel-Royal, and was musical tutor to Edward VI. About 1560 he became rector of Newton. He was a prolific composer, but most of his work remains in manuscript. See Davey's *History of English Music* (1895).

Tyldesley, tn., Lancashire, England, 10 $\frac{1}{2}$ m. N.W. of Manchester. Cotton manufacture is extensively carried on, and there are foundries and collieries. Pop. (with Shakerley, 1901) 15,500.

Tyler, tn., Texas, U.S.A., co. seat of Smith co., 95 m. E.S.E. of Dallas. Pop. (1900) 8,069,

Tyler, JOHN (1790-1862), tenth president of the United States, born in Charles City, Virginia. He entered Congress as a Republican (1816), afterwards joining the Whig party. On the election of Harrison as ninth president (1840), Tyler was elected vice-president, and in the following year succeeded Harrison as president. He vetoed the National Bank Bill, when all his colleagues resigned; but he reconstructed his ministry with the aid of Democrats. Under his government Texas was annexed to the United States (1845). He was president of the futile 'Peace Convention' at Washington (1861). On the outbreak of the war he took the part of the South, and at the time of his death was a member of the Confederate Congress. See Wise's *Seven Decades of the Union... Memoir of John Tyler* (1872), and Tyler's *Letters and Times of the Tylers* (1884-5).

Tyler, MOSES COIT (1836-1900) American historian, born at Griswold, Connecticut; became minister of the Congregational Church (1860), and of the Episcopal Church (1881). He was professor of English in Michigan University (1867-81), and of American history at Cornell (1881-1900). His chief works are *The Brawnville Papers* (1869), *A History of American Literature* (1878), *A Manual of English Literature* (1879), and *Patrick Henry* (American Statesmen Series, 1887).

Tyler, WAT (d. 1381), English rebel. Together with Jack Straw he led the rebels in the rising of 1381, and meeting Richard II. at Smithfield, demanded that there should be no outlawry, no serfdom, and but one bishop in England. Tyler was slain by Walworth, the lord mayor.

Tyler, EDWARD BURNETT (1832), English anthropologist and author, was born in London. He was professor of anthropology at Oxford, and keeper of the university museum. His *Anahuac, or Mexico and the Mexicans* (1861), was the result of a scientific tour through Mexico. His *Researches into the Early History of Mankind* (1865), *Primitive Culture* (1871; 4th ed. 1904), and *Anthropology* (1881) are standard works. He was Gifford lecturer at Aberdeen in 1888.

Tympanum, in anatomy, the middle ear, or, in a restricted sense, the tympanic membrane, the drum of the ear. See EAR.

Tynan, KATHARINE (b. 1861) (Mrs. Katharine Hinkson), Irish novelist and poet, is a native of Dublin, and was married to Mr. H. A. Hinkson in 1893. Her first book of verse, *Louise de la Val-*

Vièrè and other Poems (1885), was followed by *Ballads and Lyrics* (1891), *Cuckoo Songs* (1894), *A Lover's Breastknot* (1896), *The Wind in the Trees* (1898), and *Innocencies* (1905). Her other publications include *The Land of Mist and Mountain* (1895), *The Way of a Maid* (1895), *The Handsome Brandons* (1898), *She Walks in Beauty* (1899), *Three Fair Maids* (1900), *That Sweet Enemy* (1901), *A Girl of Galway* (1902), *The Handsome Quaker* (1902), *A King's Woman* (1902), *The Hon. Molly* (1903), *Julia* (1904), *A Daughter of Kings* (1905), and *The Adventures of Alicia* (1906). Her poetry is marked by an unforced freshness and considerable delicacy of execution.

teuch was published at Marburg (1530), and during the imprisonment that preceded his martyrdom Tyndale translated as far as the Books of Chronicles. His combined translations were published as Matthew's Bible. He was taken into custody at Antwerp, and, after fifteen months' imprisonment, was tried in 1536, and on October 6 was burned at the stake. See Demaus's *Life* (1871), Westcott's *General View of the History of the English Bible* (1905). Tyndale's original works were collected by the Parker Society (1848-50).

Tyndall, JOHN (1820-93), English physicist, was born at Leighlin Bridge, Co. Carlow. In 1847 he was appointed teacher of mathe-

netism and magne-crystalline action. He was a keen Alpine climber, and investigated the motion of glaciers, publishing, in conjunction with Huxley, a treatise on the subject. Tyndall was an able lecturer and a lucid popularizer of scientific truths. Among his best-known works are *Sound* (1867); *Fragments of Science* (1871); *Heat, a Mode of Motion* (1863); *Faraday as a Discoverer* (1868); and *Forms of Water* (1872). Tyndall was president of the British Association in 1874.

Tyndareus, in ancient Greek legend, was king of Sparta, and father, by Leda, of Castor and Clytemnestra.

Tyne, the principal river of



Tynwald Hill and St. John's Church, Isle of Man.

[Photo by Frith.]

Tyndale, WILLIAM (?1490-1536), translator of the English Bible and Protestant martyr, was born in Gloucestershire, England, and at Cambridge came under the influence of Erasmus. In 1525, at Cologne, he began the printing of his English version of the New Testament, which was completed at Worms. It owed much to the German version of Luther and the Latin by Erasmus, but more still to Tyndale himself, who was a master of style. His translation was vigorously combated by ecclesiastical authorities in England. His translation of the Penta-

maties and surveying in Queenwood College, Hampshire, where he met Frankland. After working in Berlin, he returned in 1851 to Queenwood, and devoted himself to the study of physics. In 1853 he was made professor of natural philosophy in the Royal Institution, London, succeeding Faraday as director in 1867, and retaining his post till his retirement in 1887. Tyndall's principal work was on the properties of radiant heat and its action on gases; on acoustics; on the dust of the air, and its function in bringing about putrefaction; on diamag-

netism and magne-crystalline action. He was a keen Alpine climber, and investigated the motion of glaciers, publishing, in conjunction with Huxley, a treatise on the subject. Tyndall was an able lecturer and a lucid popularizer of scientific truths. Among his best-known works are *Sound* (1867); *Fragments of Science* (1871); *Heat, a Mode of Motion* (1863); *Faraday as a Discoverer* (1868); and *Forms of Water* (1872). Tyndall was president of the British Association in 1874.

Tyndareus, in ancient Greek legend, was king of Sparta, and father, by Leda, of Castor and Clytemnestra.

Tyne, the principal river of Northumberland, is formed by the confluence of the North and South Tyne, about 2 m. N.W. of Hexham Bridge. The North Tyne rises among the Cheviot Hills, while the South Tyne springs about 8 m. S. of Alston in Cumberland. The country through which these head streams flow, each for more than 30 m., is among the most picturesque and solitary in Northern England. From a point a few miles W. of Newcastle to its entrance into the North Sea at Tynemouth, the river banks lose their rural and attractive aspect. Since 1850 the commissioners have marvellously improved the water-

way by dredging; have built great docks at Howden and North Shields; and have thrown out two immense piers, from Tynemouth and South Shields respectively, to guard the estuary. From the harbour-mouth to a little beyond Ryton (about 20 m.) the Tyne divides the counties of Northumberland and Durham, and the principal towns for which it provides an outlet to the sea are Newcastle, Gateshead, North and South Shields, Jarrow, Hebburn, Wallsend, and Walker. In the last quarter of the 19th century shipbuilding and engineering covered the river banks from Scotswood to the harbour with yards and works, the most famous being those of the Palmer Company, which practically created the modern town of Jarrow. In the year 1904 the tonnage launched (excluding warships) amounted to 236,055 tons for 116 vessels, this being a record return. The famous ordnance works at Elswick were founded by Lord Armstrong. The salmon fisheries are valuable. See Guthrie's *The River Tyne* (1880); Palmer's *Tyne and its Tributaries* (1882).

Tynemouth (including North Shields), mun. and parl. bor. and seapt., Northumberland, England, on the Tyne, 9 m. E. by N. of Newcastle. There are remains of an ancient castle. A marine parade connects with Cullercoats. The harbour is sheltered by the north and south (South Shields) piers. There are shipbuilding and industries connected with shipping. Pop. (1901) 51,366.

Tynwald, the ancient parliament of the Isle of Man. Tynwald Hill at St. John's is still used for the public proclamation of new acts. The Tynwald court has a large control in the application of the surplus revenue of the island. It also has a voice in the fixing of the customs duties, subject to the veto of the Imperial Parliament or Treasury; and a committee of the members of this court advise the governor in all financial matters.

Type, in chemistry, the system of classifying together those chemical compounds that could be obtained from one another by substitution, and hence were of the same type—a theory first enunciated by Dumas. It was afterwards extended by Gerhardt, Kekulé, Frankland, and others, the fundamental typical compounds being hydrogen chloride, HCl; water, H₂O; ammonia, NH₃; and methane, CH₄. This theory did much to initiate clear conceptions of the nature of chemical compounds, and led to the origination by Frankland of the theory of valency and the modern views of molecular structure.

Type, in theology, denotes something in the Old Testament dispensation designed to prefigure some truth or figure (the antitype) in the New Testament. Actual historical persons or events, though used as figures, have an independent purpose, and are not types in the strict sense. The paschal lamb is a true type, as provisional, and finding its essential meaning only in the light of Christ's sacrifice.

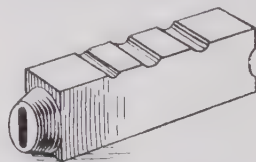
Type Metal, an alloy of somewhat variable composition, but in general consisting of 2 parts antimony and from 8 to 11 parts lead, along with 1 part or less of tin, and sometimes a little copper. It is fairly easily fusible, takes a sharp impression of the mould, and is hard enough to stand considerable wear without deterioration.

Types and Typefounding.

In the early days of printing each printer made his own types by cutting out the text on wooden blocks. The next step was to cut out the letters singly on small pieces of wood or soft metal. This was early found to be an expensive and uncertain process, and soon a system was devised for casting separate types by means of moulds in sand or other suitable material. Schoeffer is believed to have been the first to devise the matrix and hand mould on much the same principle still existing for hand casting, the only great improvement up till the 19th century being the addition of a small lever to aid rapidity in working. The earliest notice of typefounding in Britain is found in the Preface to the *Chronicles of King Alfred*, printed in 1567 by John Daye, which states that printer to have been the first to cast Saxon types in England. A decree of the Star Chamber in 1637 shows that in that year the process had become a distinct trade. In the time of Queen Anne much of the type used in the country came from Holland, and it was not till shortly after 1720 that this importation ceased, through the success of William Caslon. In the year named the Society for Promoting Christian Knowledge employed Caslon to cut punches for an Arabic font or 'fount.' Soon afterwards he took up the business of typefounding, assisted by the printer Bowyer; and in a very few years they produced types superior to any that came from the Continent. From that time till 1780 few books were printed in England with the types of any other than this foundry. Caslon's success in London was paralleled by Wilson and Bain in Glasgow in 1744.

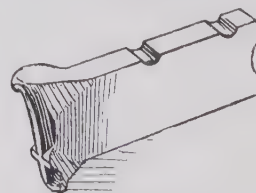
Type metal is a mixture of

tin, lead, and antimony, each founder varying the quantities according to the size of type and his own judgment and experience. In typefounding the first operation is the cutting of the punch or die of the required letter on softened steel. The punch, when duly hardened, is struck into a piece of copper by the 'justifier,' and thus produces a finished matrix, which is so trimmed and 'justified' that when placed in the mould the types cast from it will be regular in height and appearance with all the other types produced from punches of the



Ordinary letter (o), showing notches.

same fount. There are altogether about 350 different characters in a complete fount of roman and italic type. The mould into which the matrix is placed is made of steel within the two sides of a wooden shell, the sides being adjustable to thick and thin letters of the same fount. The matrix being firmly held in its place by a strong spring, the two walls of the mould are tied together, and by a small opening at the top the molten metal is poured in by a toy ladle. As the metal is poured in, the mould is jerked upwards



Overlapping letter (f).

by the workman, thus throwing the metal down into the matrix, and giving a firm, solid face to the type, assisted in this by what is termed the 'break,' a useless tag of metal which adheres to the type at the opening into which the metal is poured. The spring being now loosened, the type drops out. This process is done with great rapidity, averaging from 600 to 800 per hour, according to the size of the type. The types are now subjected to a series of 'finishing' processes, such as breaking off the tag, rubbing along a prepared file to give thorough smoothness, and finally 'dressed' by being turned up-

side down in specially-prepared blocks, when a small plane channel-cuts a groove in the feet of the types, removing all unevenness and enabling them to stand properly. Notches or nicks are also ploughed on the front of the types, these varying in each foundry. The types are afterwards tested by standards for body, height, and evenness, and then microscopically examined for defective letters. Overlapping letters, such as *f* and *j*, are 'dressed' on specially-prepared files. Types of large size with fine lines are made by a method of pump casting invented by David Bruce of New York in 1834, with only some slight difference in detail from the ordinary plan of hand casting.

There are many varieties and sizes of types, but those in general use for book work, graduating downwards, are—(1) pica, (2) small pica, (3) longprimer, (4) bourgeois, (5) brevier, (6) minion, (7) emerald, (8) nonpareil, (9) ruby, (10) pearl, (11) diamond, and (12) brilliant—the latter five being seldom used except for footnotes to the larger sizes, or in pocket Bibles and Prayer Books. Their relative sizes are here shown:—

- (1) Encyclopædia.
- (2) Encyclopædia.
- (3) Encyclopædia.
- (4) Encyclopædia.
- (5) Encyclopædia.
- (6) Encyclopædia.
- (7) Encyclopædia.
- (8) Encyclopædia.
- (9) Encyclopædia.
- (10) Encyclopædia.
- (11) Encyclopædia.
- (12) Encyclopædia.

Pica is the usual standard of measurement used by printers, and is nearly one-eighth of an inch in width; nonpareil is half pica. A complete assortment of type is called a fount, to which a proportionate amount of the separate letters is given, according to frequency in use. Thus, of *e* will be given three times the quantity of *a*; of *a*, *t*, *o*, and *s*, two-thirds of *e*; of *r*, one-half; of *u*, one-fourth; of *v*, one-tenth; of *z*, one-sixtieth; and so on.

Of typesetting machines there are now many. One of the earliest was that of Henry Didot of Paris (1819), an unsuccessful attempt to cast many types at one operation by a multiple mould. From the pump process of Bruce was developed another casting machine, which was first introduced into Britain by Miller and Richard of Edinburgh. With this machine all the preliminary movements were done automatically, the types when released from the mould being 'dressed' in the usual way. In 1862, John

son and Atkinson of London patented another, which not only cast the types automatically, but also rubbed, dressed, and rendered them almost ready for immediate use by the printer. Another and later machine of this kind is that of the Wick's Rotary Typecasting Company, the special appliances of which claim positive accuracy.

Other machines have followed, several of which are associated generally with the typesetting, as in the Linotype or Mergenthaler, and the Monotype. See TYPESETTING MACHINES and PRINTING.

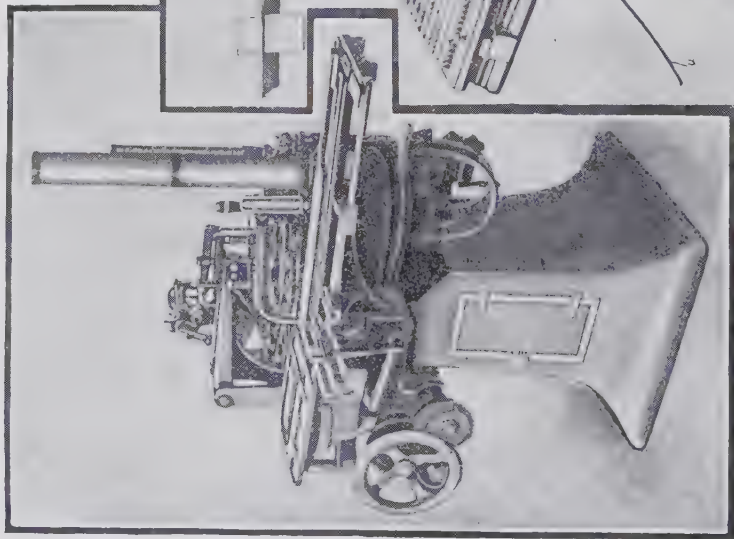
Typesetting Machines. The first recorded typesetting machine is that of Church, in 1822. Since then, many machines have been built, but only one or two of these have proved conspicuous successes. It is convenient to divide typesetting machines into two classes:—

(1.) *Machines setting single letters of ordinary type.*—In all the machines in this group each letter is stored in a separate magazine. The required letters are released one by one from their magazines by a mechanical action; this mechanical action is set in motion by the operator playing on a keyboard similar to that of a typewriter; and each letter, when released, slides or is carried into its proper vertical position in the line of matter which the operator is setting. The earliest machines of this group which achieved any reputation were the Fraser (on which the *Encyclopædia Britannica* was set, 1875-89), the Kastenbein (introduced into the *Times* office in 1869), and the Hattersley. The magazines of all these machines were narrow grooves set vertically in parallel lines, with channels leading from the bottom of each groove and converging at the point where the released letter falls into its proper position in the line. The Thorne and Simplex machines are improvements, but are more complicated. Their magazines are vertical grooves cut in an upright cylinder. As each letter falls down it is conveyed horizontally to its proper position. These machines can only set word after word continuously; the division of the matter into lines of the required length, and the 'justification' of these lines, must in their case be done by hand. The latest machines (the Empire, the Dow, and the Paige) have automatic justifying devices of a very complicated nature, which perform all the work previously done by hand. The natural companion of a machine for composing single types is a machine for distributing these types for re-setting. Almost all the machines referred

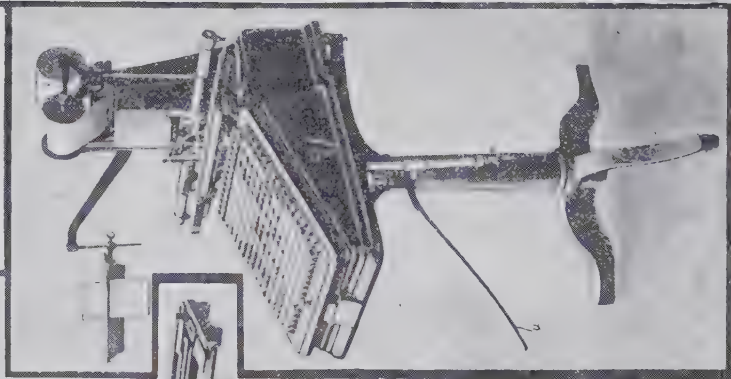
to have some device for doing this mechanically, though Church—the original inventor—recast the metal and filled his magazine with new type fresh from the melting-pot. The Fraser has a separate distributing machine operated by a keyboard, and exactly the converse of the composing machine. In this way it was able to make use of ordinary typesetters' type. Most of the other machines have distributors of an automatic kind, in which a continuous movement brings each type into its proper magazine. The letters are distinguished from one another, in such cases, by special nicks or grooves cast in the type, which exactly fit corresponding projections in the slot of the magazine. This, of course, involves the use of specially cast 'founts' of type. Such distributing machines may be either separate from the composing machines (as in the Dow), or combined with them (as in the Thorne). In the latter case, the vertical cylinder is divided into two portions, the upper of which revolves with a step-by-step movement. The grooves of the upper section are filled with undistributed type. As they revolve, they discharge the nicked letters at the bottom into their shaped grooves in the lower section of the drum.

(2.) *Type casting and setting machines.*—The machines which both cast type and set it by the operation of a keyboard are a great advance on all machines in the first group. Two of these are in very general use. The Linotype (formerly called the Mergenthaler, after the inventor who perfected it) is in general use in newspaper offices all over the world. The name implies that the machine casts type in a line instead of single letters. The Linotype does not, strictly speaking, set types: it sets matrices (moulds) for the type. Each matrix is a flat plate of brass, with the mould for the type face engraved on its end. The matrices (like pass-keys) are distinguished from one another by wards cut in the edge. They are stored in grooved magazines at the top of the machine, and are released by the operation of the keyboard. As the operator plays upon the keyboard, the matrix of each letter falls down in its proper place in the line. Between each pair of words the depression of a space-key inserts a wedge-shaped space. The completion of each line is seen from an indicator, and when the last word has been set the movement of a lever expands the spaces sufficiently to justify the line. There is then in position a row of matrices representing a whole

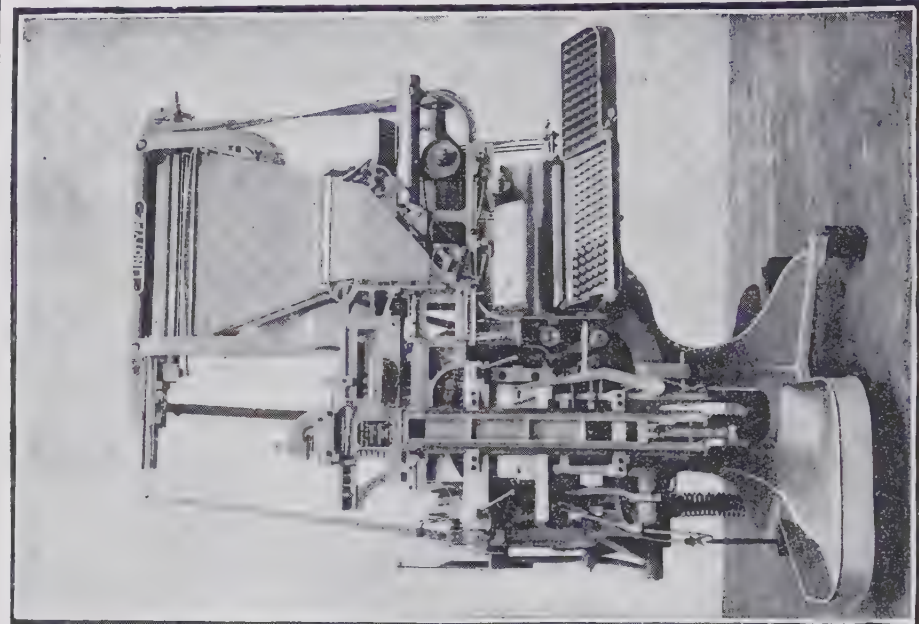
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Type casting and setting Machines.
1. Lanston monotype casting machine. 2. Keyboard. 3. Linotype machine.

line, with equal spaces dividing the words. These are placed above a groove of the right depth and thickness, and form a mould for a complete line of type; metal is then pumped in from a melting-pot, and the line of type, in one solid block, called a 'slug,' is discharged into a galley. The matrices are then taken to the top of the machine by a carrier, and again distributed in their magazines. On a linotype machine an expert operator can set from 5000 to 6000 ems per hour. Its speed makes it indispensable in newspaper offices, but the difficulty of getting the matrices perfectly aligned, the difficulty of getting the long slug cast at a perfectly even temperature throughout and without bubbles, and the expense and difficulty of corrections (each one of them involving re-setting of at least a whole line), have prevented its general adoption for the finest work.

Even more ingenious is the Lanston Monotype, a machine which casts and sets single types in lines of the required length, automatically justifying each line. This machine is in two parts—the keyboard, which does nothing but punch tiny holes in a reel of paper, and the caster (into which the punched roll is fed), where the casting and setting are controlled by the punched reel of paper. The keyboard machine has at the top 31 punches under which a reel of paper is slowly passed. When a key of the keyboard is struck, two of these punches ascend and cut out little holes in the paper. By combinations of the various punches a different pair of holes can be selected for each character. When the line has been set (or rather punched), the operator has simply to read off from a calculating drum (which revolves and calculates all the time the line is being set) certain figures which tell him what additional space has to be inserted between the words to perfectly justify the line. Having read off the figures, he presses red keys at the top of the keyboard, and at the end of the line punches out holes to represent the space needed to be added to the constant space already punched. The punching of these justifying holes at the end of the line makes it necessary that the punched reel shall be fed backwards into the casting machine. Thus the first punched holes in any line which pass through and control the machine are those for justifying, and their effect is to cause the machine to increase the constant spaces in that line by the width of the justifying space.

The casting machine is a complicated mechanism. When the paper roll enters the machine, currents of air pass through the punched holes. These set the mould to the right size for the character which the holes represent. At the same time they place over the mould a matrix of the required type face. Mould and matrix being in position, metal is pumped up from a melting-pot below. The type when cast is placed in its proper position in the line, and as each line is finished it is removed automatically to a galley.

Two other machines demand a word of mention. The Monoline is on a similar principle to the Linotype, and the Tachytype is like the Monotype. See Southward's *Type-composing Machines* (1890); De Vinne's *Economics of Composing Machinery* (1889); and *Practice of Typography* (1901); and Southward's *Modern Printing* (1898-1900).

Typewriters are machines used for writing instead of pen and ink, or pencil. The paper being clamped upon a roller, the operator produces printed characters by striking upon a keyboard. The machines may be classed as machines in which the operator is able to see each character as produced as well as several lines of the writing, and those in which the writing is not visible, but can be inspected by lifting the roller upon which the paper is placed; machines in which the type is inked by means of a saturated pad, and those in which a saturated inking-ribbon is used; machines which have a key for each character, and those in which one key serves for several characters. The keyboard consists of a series of ivory, bone, or vulcanite discs, each usually mounted upon a vertical rod; this is connected to a combination of jointed levers, which form the movement for the characters printed by the particular key that is struck. Each key has marked upon its upper surface the character or characters which it prints, and in many machines the keys are arranged in a standardized order. With keyboards in which each key is used for one character only, the keys are so arranged that the capital letters, the small letters, the figures, and the punctuation signs are grouped respectively together, and each group may be differently coloured; or if three groups are used, two black groups will be separated by a white group. When each key carries three characters, each movement carries three types, and a rocking lever or change key, termed a 'shift key,' is provided at the side of the keyboard

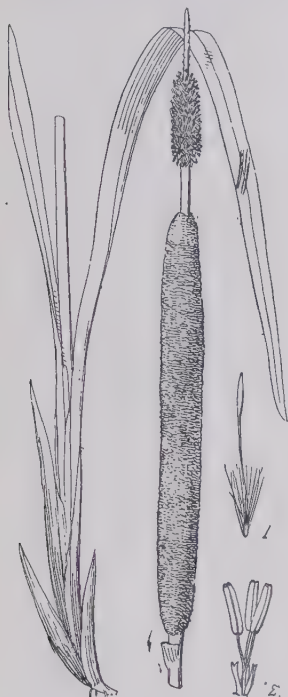
to shift the paper under one or other of the characters. When this lever is in mid-position, small characters will be printed; if it is moved forward, capitals; and if backward, figures and punctuation signs will be printed. The movements are arranged radially from a central point in the machine, at which is placed a steel guide, all characters being printed at this point. When a key is depressed, the character is carried to the guide and printed upon the paper; when the key is released, the movement returns automatically to its normal position. The paper is clamped on a roller termed the platen, and this is mounted on a sliding carriage, which can be moved rapidly to bring the type guide into any position along the line; it is also moved the space of a character by the operator striking upon a lever placed near the keyboard to produce the spacing between words. When the operator releases each key, the carriage automatically moves a distance equal to the breadth of a letter. In order that the writing may not overrun the paper, an alarm bell gives a signal as soon as the line nears the edge. The spacing between the lines is produced by the rotation of the roller, a lever fitted at one end being moved a distance equal to the distance it is desired that the lines should be apart. Adjustable stops are provided to limit the movement of the lever and make the spacing equal. When inking pads are used, the types rest normally upon these pads, so that they are always charged with ink. When an ink ribbon is used, it is carried on two spools, being unwound automatically from one and wound on the other repeatedly until the ink is exhausted. It is interposed between the type and the paper, and the characters strike the ink from it on to the paper when the keys are pressed. Several similar copies can be written at once by using several sheets interleaved with manifold paper; and if metal type is used, stencil sheets of oiled paper can be cut.

Typha, a genus of marsh plants belonging to the order Typhaceæ. They bear spadixes of male and of female flowers, which closely resemble one another in appearance. Two species are British natives—*T. latifolia*, the reed mace, or cat-o'-nine-tails, which bears its spikes of dark-brown flowers in late summer; and *T. angustifolia*, a much smaller plant.

Typhaceæ, an order of plants with monococious arrangement of small flowers, borne in spadixes. They are frequenters of watersides and marshy ground in

various parts of the temperate and tropical regions of the world. The female flowers are succeeded by subdrupaceous or membranaceous fruits. The only two genera are *Typha* and *Sparganium*.

Typhoid Fever, a synonym for enteric, pythogenic, or gastric fever. See ENTERIC FEVER.



Typha.

1. Female flower; 2. male flower.

Typhon, or **TYPHŒUS**, in ancient Greek mythology, a gigantic monster, conceived either as a hurricane or as a fire-breathing giant. Homer tells that he was buried underground by Zeus. Hesiod, however, treats Typhon (or Typhaon) and Typhœus as distinct. The latter was a hundred-headed monster, who fought with Zeus, and was slain by a thunder-bolt; Zeus then caged him under Mt. Etna. He was the father of the storm winds. Typhon was generally regarded as the personification of the hurricane; hence the modern word 'typhoon.'

Typhoon, a destructive cyclone that occurs in the China Sea, generally during August, September, and October. It originates in the warm equatorial Pacific south-east of Asia, and extends over the Philippine and Japanese islands and the neighbouring coast of China.

Typhus Fever, an acute, specific, infectious disease, of an

epidemic nature. It is almost certainly due to a micro-organism, but the microbe has not yet been identified. The chief contributing causes are overcrowding and starvation. The disease is now rare in England, but it still lingers in Irish towns and in the Irish districts of great cities. During times of famine it assumes epidemic proportions. Typhus has passed under many names, such as 'camp fever,' 'jail fever,' 'putrid fever,' and 'ship fever.' It occurs chiefly in winter, when the poor are apt to secure warmth at the expense of ventilation. Fresh air is strongly antagonistic to the typhus organism. After a period of incubation lasting as a rule about twelve days, febrile symptoms appear, being sometimes, though not usually, ushered in by a rigor. The temperature continues to rise for three or four days, till it reaches 102° or 104° F. The tongue is at first coated with a white fur, which gradually dries, and becomes yellowish and brown, while sordes accumulate about the teeth and gums. Vomiting is often present, with severe headache and pain in the back and limbs. The patient is generally sleepless, and mental confusion and cloudiness are characteristic of the 'typhoid state,' and are usually progressive. The eruption presents three elements—(1) a subcutaneous mottling; (2) smaller deeply congested spots, which are not raised above the surface, and which at first disappear on pressure; and (3) small petechial hæmorrhages, which are sometimes dark brown. The rash frequently appears first about the wrists—it is most marked, as a rule, on the flanks; but the petechiæ are most numerous on the back. It is seldom fully developed before the fifth or sixth day, and it persists till the crisis occurs, after which it gradually fades. The temperature remains fairly steady till about the fourteenth day, and the crisis is of moderate abruptness.

Many typhus patients die from head symptoms. Those in whom sleeplessness is marked frequently exhibit delirium ferox, in the course of which convulsions may occur. In other cases the maniacal delirium passes into coma. Exhaustion frequently leads to a fatal result. Pulmonary complications are frequent, and the immediate cause of death may be pneumonia or bronchitis. Jaundice is not uncommon, and is of grave significance in typhus. In bad cases of this fever buboes occasionally develop in the axilla and in the neck. Bedsores are extremely apt to form. The mortality is highest in the old, and alcoholism greatly decreases a patient's chances of recovery.

The dieting should be conducted

on the same lines as in enteric fever. In typhus the nervous symptoms call for special care. Sleeplessness must be overcome by the administration of chloral, hyoscyamus, sulphonal, and paraldehyde. Delirium may necessitate blistering over the scalp or the application of cold to the head. Stimulants are generally beneficial, especially towards the end of the pyrexia. The mouth requires careful attention, and should be swabbed frequently with antiseptics.

Tyr. See MYTHOLOGY—Northern.

Tyrant, a word used by the ancient Greeks to denote the ruler of a state who acquired his power unconstitutionally. It was first used by Archilochus (c. 700 B.C.) of Gyges, king of Lydia. The period from 650 to 500 B.C. is often known as the age of the tyrants, there being famous tyrannies at Sicily, Megara, Corinth, Athens, Samos, and Ephesus. Many tyrants, such as Pisistratus of Athens, Hiero of Syracuse, and probably Clisthenes of Sicily, were not only wise rulers, but lenient in their government. Tyrants did much to extend the commerce of their cities, to adorn them with buildings (the oldest great temples both at Corinth and Athens date from the period of the tyrants), and to develop literature, science, and art: thus Pisistratus established dramatic competitions at Athens, Gelo and Hiero patronized Simonides and Pindar, and Dionysius of Syracuse was himself a tragic poet.

Tyrant-birds (*Tyrannidae*), a family of New World passerine birds, which extend from the Arctic regions to Tierra del Fuego, but are most abundant in S. America. The birds are insectivorous, and in appearance and habits somewhat resemble the shrikes. An example is the king-bird or bee-martin (*Tyrannus carolinensis*) of the United States, a bold and active bird, much disliked by farmers on account of the number of bees which it eats. The male is dark-coloured above and white below, with a flame-coloured patch on the head.

Tyrconnel, RICHARD TALBOT, DUKE OF (1630–91), was born of an Irish Roman Catholic family, and saw service as a royalist against Cromwell, being one of the defenders of Drogheda. After the restoration he was in the service of the Duke of York, and became the acknowledged representative of the Irish Roman Catholics. When Charles II. and later James II., contemplated the remodelling of the Irish army, Talbot was their chosen instrument, and purged of all Protestant sentiments the regiments on the Irish establishment. He was appointed

viceroy in 1687. After the revolution he became James II.'s right-hand man, was present at the battle of the Boyne, and fled to France after the raising of the siege of Limerick. He returned to Ireland in 1690, and died of apoplexy or of poison after the battle of Aughrim.

Tyre. See CYCLE.

Tyre, one of the most famous cities of antiquity, stood on the Phœnician coast, 20 m. s. of Sidon, partly on an island, partly on the mainland. The mainland city was the older foundation; the island was not inhabited until after Nebuchadnezzar's siege. There were two harbours, one on each side of the island. For many centuries Tyre was one of the chief trading-places of the ancient world, and widely famous for its purple dyes. Its prosperity was very great; yet the population probably never

exceeded 100,000. It stood several famous sieges—one of five years from Shalmaneser, king of Assyria, probably in 724-720 B.C., and one of thirteen years from Nebuchadnezzar, from 587 B.C., both of which were unsuccessful; and one of seven months from Alexander the Great, who took the island city by constructing a mole from the mainland, in 332 B.C. Tyre was thenceforward overshadowed by Alexandria, and its prosperity ceased with the conquest of Syria by the Ottoman Turks in 1516.

Tyre, WILLIAM OF. See WILLIAM OF TYRE.

Tyre, or TIRIE, an island of the Inner Hebrides, Argyllshire, Scotland, 19 m. N.W. of Iona. It is treeless and flat; contains several freshwater lakes; has marble quarries, Scandinavian

forts, and standing stones. Area, 30 sq. m. Pop. (1901) 2,195.

Tyrnau, or NAGY-SZOMBAT, tn., Hungary, 27 m. E.N.E. of Pressburg; was the residence of the Hungarian primates, and possessed a university till 1773. Pop. (1900) 13,181.

Tyrol, crown land (with Vorarlberg) of Austria, N. of Italy and E. of Switzerland; is noted for the beauty of its scenery, and covers an area of 10,300 sq. m. The Alps traverse the country: the Dolomites rise in the s., but the culminating point is the Ortlerspitze (12,810 ft.). The Brenner is the most famous pass. The Inn, the Adige, and the Drave have part of their courses in Tyrol. Silkworms are reared, and dairy produce, fruit, and wine are exported. Forests cover 46 per cent. of the surface. Salt, zinc, lead, and sulphur are mined. Silks, iron goods, cottons, linens, leather,

and w. of the valley of the Piave. The s. portion is described under DOLOMITES. The N. portion comprises the limestone ranges of Bavaria and Salzburg, its chief summits being the Passeierspitze (9,968 ft.), the Dachstein (9,830 ft.), and the Zugspitze (9,738 ft.), the last-named the highest summit in Bavaria. Between these two districts rise the Alps of Central Tyrol. Between the Reschen Scheideck and the Brenner is the Oetzthal group, culminating in the Wildspitze (12,382 ft.) and the Weisskugel (12,291 ft.). Of this the Stubai group to the N.E. is a topographical appendage, and culminates in the Zuckerhütl (11,520 ft.). East of the Brenner line lies the Zillertal group, which culminates in Hochfeiler (11,559 ft.), the Mösele (11,438 ft.), and the Olperer (11,418 ft.). Then, still more to the E., rises the Hoher Tauern, with the Gross Glockner (12,461 ft.), and the Gross Venediger (12,008 ft.). Still more to the E., and stretching towards the Semmering pass, is the Nieder Tauern range, culminating in the Hoch Golling (9,393 ft.) and the Marchkarspitze (9,243 ft.).

Tyrone, co., prov. of Ulster, Ireland; mountainous or hilly in N. and s. (Sperrin Mts. over 2,000 ft. on N. border; Slievebeagh in s.), flat towards Lough Neagh, E.; drained N. by affluents of the Foyle, s. and E. by the Blackwater and the Ballinderry. Agriculture and cattle-rearing are principal industries; linen and coarse woollens are manufactured. The county is represented in Parliament by four members. Area, 1,260 sq. m. Pop. (1901) 150,470.

Tyrone, HUGH O'NEILL, EARL OF (?1540-1616), grandson of the first Earl of Tyrone, and known as 'The O'Neill'; headed a rebellion against Elizabeth in 1597. He met at first with some success against Essex, but was defeated by Mountjoy, in spite of help from Spain. After the capture of Kinsale in 1601, he gave his allegiance to the English crown, and was pardoned. In the next reign O'Neill was again intriguing with Spain, and in 1607 he was exiled, and his possessions were confiscated.

Tyrrhenian Sea, that part of the Mediterranean which lies between the w. coast of Italy and the islands of Corsica and Sardinia to the w. and Sicily to the s.

Tyrtæus (fl. c. 650 B.C.), Greek elegiac poet, was a native of Athens, who was sent to Sparta when she was hard pressed in the second Messenian war. Tyrtæus aroused the courage of the Spartans by his poems, and so won victory for them. He wrote both elegiac and anapaestic poems of martial strain, and also



glass, and paper are manufactured. Singing birds are bred for export, particularly the canary in the valley of the Inn. The population is almost entirely Roman Catholic, and German-speaking in the N. and centre. The chief town is Innsbruck. Tyrol was part of Rætia and Noricum in Roman times, and was subsequently a part of Bavaria. In 1363 the Hapsburgs came into possession. In 1805 Napoleon granted it to Bavaria, and in 1809 parts were ceded to France, though the Tyrolese under Andreas Hofer made a stubborn resistance. In 1814 Tyrol was restored to Austria by the treaty of Paris. Pop. (1900) 850,062.

Tyrol, ALPS OF, a convenient (though not strictly accurate) name for the Alps which rise E. of the Reschen Scheideck pass

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Scenes in the Tyrol.

1. Landeck and Ladis and the Ortler. 2. Meran, Aussich, and Küchelberg. 3. Oetzthal. 4. Innsbruck. 5. Pörtschach. 6. The Dolomites and Prager Wildsee. 7. The Ortler from the Malser-Halde.

one called *Eunomia*, or 'law-abidingness,' intended to allay the political dissensions existing at Sparta. In the *Classical Review* for 1897 Dr. A. W. Verrall suggested the scarcely tenable theory that Tyrtæus was contemporary with the third Messenian war (464-460 B.C.). For his fragments see Bergk's *Poetae Lyrici Graeci* (ed. 1900).

Tyrwhitt, THOMAS (1730-86), English classical commentator, was born in London. He was appointed deputy secretary of war in 1756. This post Tyrwhitt held until created clerk of the

best known by his *Memoir of the Life and Writings of Lord Kames* (1807), his *Historical and Critical Essay on the Life of Petrarch* (1810), and his *Essay on the Genius and Writings of Allan Ramsay*, prefixed to the collected editions of Ramsay's *Poems*.

Tytler, PATRICK FRASER (1791-1849), son of Alexander Fraser Tytler, achieved special distinction by his *History of Scotland* (1828-43), which, undertaken on the suggestion of Sir Walter Scott, is distinguished for its thoroughness of research and its careful and well-balanced judg-

lished a defence of Mary Queen of Scots, entitled *Inquiry, Historical and Critical, into the Evidence against Mary Queen of Scots* (2nd ed. 1767, a third in 1772, and a fourth in 1790). In 1783 he published *The Poetical Remains of James I. of Scotland*, with a dissertation on his life and writings. For Arnot's *History of Edinburgh* (1779) he wrote an appendix on Scottish music.

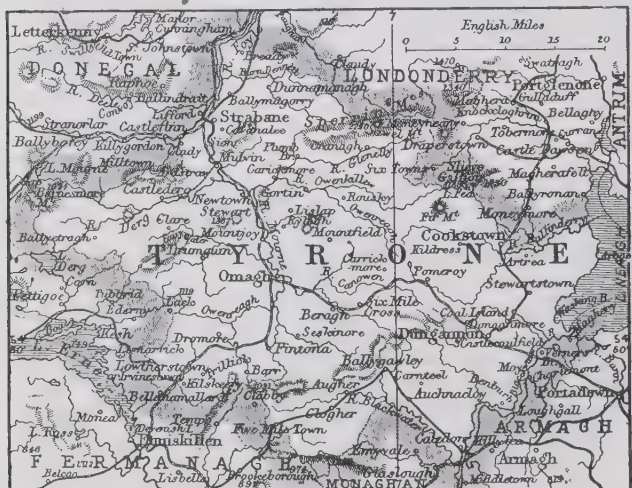
Tyumen. See TIUMEN.

Tzar. See TSAR.

Tze-hsi (1834), dowager empress of China, was born in Canton, and became the wife of the Emperor Hsien-Feng. Her son reigned as Tung-Chih, and on his death (1875) she became regent for her nephew, Kwang-Asu, till he reached the age of twenty-one, showing great energy and ability in her administration of the affairs of state. Kwang's opinions were entirely conservative, and on Sept. 21, 1898, in conjunction with Li Hung Chang, by a coup d'état, she assumed the reins of power, arrested the emperor's reforming advisers, and confined the emperor himself in the Summer Palace in Peking, from which he escaped to Shanghai in a British steamer. Tze-hsi nominally resigned her power in 1889. Since that year, however, she has managed to keep a tight hand over the weak emperor. She encouraged the Boxers in their insurrection, and is animated by an unrelenting hostility to all foreigners, ordering their expulsion from the country (June 1900). The situation was relieved by an allied army of nearly all the treaty powers, and Tientsin and Peking were captured. The imperial court fled, and remained in voluntary exile until 1902. Meanwhile a peace protocol was signed between the envoys of the treaty powers and the Chinese plenipotentiaries.

Tzetzes, JOHANNES, a Greek man of letters of the 12th century. Among his once celebrated poems were *Iliaca*, the story of the siege of Troy; *Chiliades*, a collection of tales on legendary subjects. He had a marvellous memory and an immense store of information.

Tzia. See CEOS.



Tyrone.

House of Commons in 1762. He finally retired in 1768. To this scholarly critic we owe the well-known edition of Chaucer's *Canterbury Tales*, with glossary and notes (1775, 1778), the edition of Aristotle's *Poetics* (1794), *Poems* by Thomas Rowley, and *Conjectures on Æschylus, Euripides, and Aristophanes*.

Tytler, ALEXANDER FRASER (1747-1813), professor of civil history in the University of Edinburgh, and afterwards judge of the Court of Session, with the title Lord Woodhouselee, son of William Tytler. He is perhaps

ment. Among his other works are *Life of James Crichton of Cluny*, commonly called the *Admirable Crichton* (1812; 2nd ed. 1823); *Lives of Scottish Worthies* (3 vols. 1831-3); *Life of Sir Walter Raleigh* (1833); *Life of Henry VIII.* (1837); and *England under the Reigns of Edward VI. and Mary* (2 vols. 1839).

Tytler, WILLIAM (1711-92), Scottish historian and critic, was born at Edinburgh. He was admitted in 1744 writer to the signet; but he devoted much attention to Scottish literature and history. In 1759 he pub-

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U. In Greek this vowel had a sound similar to its value in French *lune* (high-front-narrow sound); in Latin it was employed for the high back vowel (English *rule, full*). The Latin value is that generally given to it in phonetic notation. This was the sound of English *u* until after the Norman conquest. Long *u* lost this value under French influence; it was displaced by *ou* (*wound*), and received a French value (14th century). In the 17th century long *u* became a diphthong, with the value of its modern name; it occurs chiefly in

alphabet by the Greeks. Its form and its value combine to justify the conclusion that it was a differentiation of Semitic *waw*, which still has its original place in our alphabet under the form *F*. See *Y*.

Ubeda, city, prov. Jaen, Spain, 26 m. N.E. of Jaen; with lead mines. Pop. (1897) 20,026.

Ucayali. See *AMAZONS, PERU*, and *BOLIVIA*.

Uccello, or *UCILLO* (1396-1475), the name given to Paolo di Dono, sculptor and painter, born at Florence; was the pupil of and collaborator with Lorenzo Ghi-

survivors (about 650) are now united with the Creeks on the Arkansas R., Indian Territory.

Udaipur, also called *MEWAR* or *MEYWAR*, feudatory state in Rajputana, India, with an area of 12,861 sq. m., and a population of (1901) 1,021,664. The capital, Udaipur, or Oodeypore, 120 m. S.E. of Jodhpur, has an imposing palace. Pop. (1901) 45,595.

Udal. See *ALLODIAL*.

Udall, or *UVEDALE*, JOHN (?1560-92), Puritan. For his Puritan sympathies and his tracts against the bishops (*The State of the Church, A Demonstra-*



Udaipur.

words of French origin (*fortune, duke*). Short *u* acquired a new value about the middle of the 17th century (example, *but*), but its old value also survives (*rule*). An occasional early use of *u* in place of *e* or *i* is still represented in the words *bury* and *business*. Regarding consonantal *u*, see *V* and *W*. The form *U* is simply a modification of *V*. In the Greek alphabets *V* and *Y* were used alternately. *Y* became the standard Greek form; *V* was the form received into the Roman alphabet. *Y* appears to have been older than *V*. It was an addition made to the

berti in constructing the gates of the baptistery. He afterwards studied painting, and executed two frescoes, *The Deluge* and *The History of Noah*, for Santa Maria at Florence, an equestrian portrait of John Hawkwood (Acuto), and a *Combat of Cavalry*. Five of his works are in the Louvre at Paris.

Uchi, or *YUCHI*, North American aborigines, formerly numerous in S. Carolina and Georgia. They appear to have spoken a stock language, and have been identified both with the Cofitachigui of De Soto and the lost Apalaches. The

tion, The Dialogue, 1588) he was deprived of his living at Kingston-upon-Thames (1588), and in 1590 was sentenced to death on suspicion of complicity in the Marprelate tracts, but he was pardoned in 1592. He wrote a Hebrew grammar and dictionary, entitled *The Key of the Holy Tongue* (1593).

Udall, or *UVEDALE*, NICHOLAS (1505-56), English dramatist, a native of Hampshire, was successively headmaster at Eton (1534), vicar of Baintree (1537-44), prebendary of Windsor (1551), and rector of Calborne, Isle of Wight

(1553). In 1554 he became playwright to Queen Mary, and headmaster of Westminster School. His *Ralph Roister Doister* is the earliest known English comedy (printed c. 1566).

Uddevalla, trading tn., Göteborg co., Sweden, 50 m. N. of Gothenburg; exports oats and timber, and has shipbuilding and wool manufactures. Pop. (1900) 9,442.

Udine (anc. *Vedinum*), tn., cap. of prov. of same name, Venetia, Italy, 60 m. N.E. of Venice; has manufactures of silks, velvets, cottons, and leather. On a hill in the centre of the town stands the castle, once the residence of

death. Among his many works are *System der Logik und Geschichte der logischen Lehren* (1857; Eng. trans. 1871), *Grundriss der Geschichte der Philosophie von Thales bis auf die Gegenwart* (1862-6; Eng. trans. 1872) and *Ueber die Echtheit und Zeitfolge der Platonischen Schriften* (1861). Ueberweg also translated Berkeley's *Principles of Human Knowledge* into German. See *Life* in German by F. A. Lange (1871).

Ufa. (1.) Government, E. Russia, lying between Perm on N. and N.E. and Kazan and Samara on W. Area, 47,112 sq. m. Pop. (1897) 2,220,497. The surface belongs

ported. The Siberian trunk railway crosses the province. Of the population, slightly over one-third are Great Russians and Orthodox; of the remainder (Bashkirs, Meshcheriaks, Tartars, Cheremissians, Chuvashes, Mordvins, and Votiaks) the great majority are Mohammedans, though about 100,000 are still pagans (2.) Town, E. Russia, cap. of above gov., 280 m. E.S.E. of Kazan. A station on Siberian trunk line, and an episcopal see, it has a cathedral, and is a river-port. There are tanneries, tallow foundries, breweries, distilleries, brick works, sawmills, manufactories of soap, candles, ginger-



the patriarchs of Aquileia, now used as a barracks. Among its other buildings are its Romanesque cathedral, the archiepiscopal palace, and the municipal buildings. Pop. (1901) 36,899.

Udong, tn., Cambodia, French Indo-China, on a right affluent of the Tonle sap, 23 m. N.W. of Pnompenh; till 1866 the capital of Cambodia. Five miles to the north are remains of triple walls once surrounding the city of Lovek or Cambodia, the capital in the 17th century. Pop. recently about 16,000, but rapidly declining.

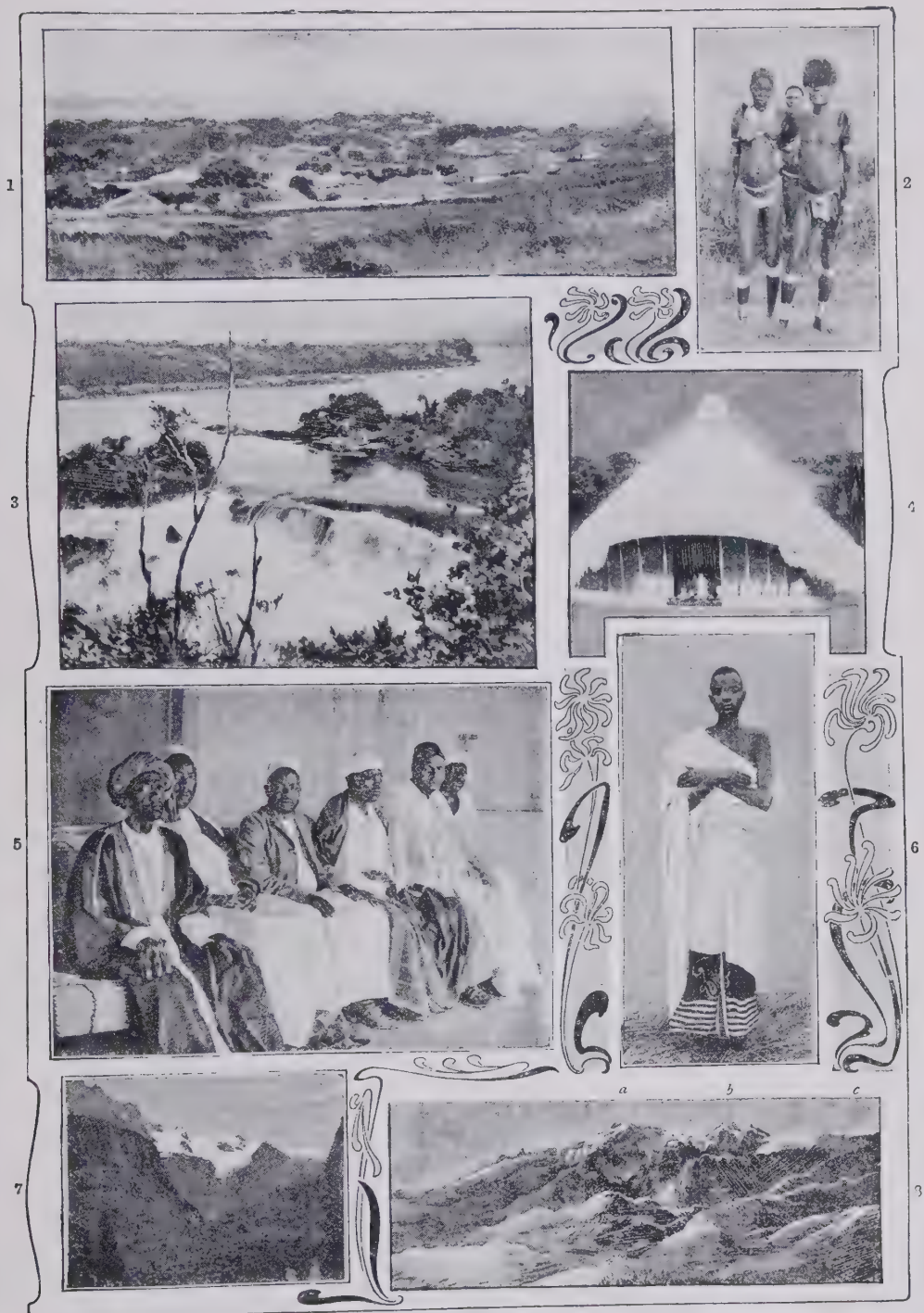
Ueberweg, FRIEDRICH (1826-71), German philosopher, was born at Leichlingen in Prussia. He occupied the chair of philosophy at Königsberg from 1862 till his

for the most part to the Ural hill region (over 5,000 ft.); here is some of the most picturesque land of European Russia (outside the Crimea). The whole government belongs to the Volga basin (through the Kama). The principal mineral deposits are iron and copper; coal, salt, jade, and potter's clay are also extracted. The granite and porphyry of Ufa are famous. Forests cover 46½ per cent. of the area. Linseed and linseed-oil are articles of export. Bee-keeping flourishes. The larger industrial establishments include iron and copper foundries, tanneries, distilleries, manufactories of cloth, hides, soap, and candles. Metals, hides, timber, and grain, of about £890,000 annual value, are ex-

bread, and pottery. It has an important fair. Pop. (1850) 12,000; (1897) 49,961.

U.F.C., United Free Church (of Scotland).

Uganda, British protectorate in Equatorial Africa. It extends northwards to 5° N., eastwards to Lake Rudolf and British E. Africa, southwards to the Victoria Nyanza and German E. Africa, and westwards to the Congo Free State. For administrative purposes it is divided into five provinces—Central, Rudolf, Nile, and Western Provinces, and kingdom of Uganda. Area, 89,500 sq. m. From 20,000 ft. high in Ruwenzori, Uganda sinks to an average of 2,000 ft. Mt. Elgon is surmounted by a crater 14,000 ft. high. The chief river is the



Scenes in Uganda.

1. Entebbe. 2. Kavirondo man and wife. 3. Ripon Falls. 4. House of the king of Uganda at Mengo. 5. Baganda chiefs. 6. An Unyoro youth. 7. Snowfields. 8. The range of Ruwenzori—*a*, Kiyanja Peak; *b*, Duwoni Peak; *c*, Saddle Mountain. (From photographs by Sir Harry Johnston, G.C.M.G.)

Nile, which issues out of the Victoria Nyanza. The Semliki flows out of Albert Edward into Albert Lake. The rainfall averages from 10 to 100 in. according to locality. The soil is in general very fertile. Uganda Province and Unyoro abound with magnificent timber. The swamps are rank with papyrus, rushes, reeds, and coarse grass. Tropical forest fringes the margin of the Victoria Nyanza and clothes the Semliki valley. Rubber of good quality is produced. Other economic products are coffee, scaccia gums, gum copal, incense, shellac, and ebony. Cotton and indigo grow wild. Sugar cane grows abundantly, as do also groundnuts, sesamum, castor oil, and other oil plants. The natives consist of Bantu and Nilotic negroes, Masai, pigmies (in Semliki forest), and some Hamitic tribes. The total population is under 4,000,000, of whom about one-fourth are Waganda. The Waganda (Uganda people) are noted carpenters and iron-workers. The leading commercial products are ivory, rubber, timber, skins, and cattle. The total trade is valued at less than a quarter of a million sterling. Uganda is under a British commissioner, residing at Entebbe. The native capital is Mengo, close to which a Protestant cathedral was built in 1904. Under Mutesa, king (1880-84) of Uganda, this region was visited by Speke (1862), Stanley (1875), and Emin Pasha (1876). After the death of Mutesa his son Mwanga instituted a general massacre of Christians. But in 1890 Uganda came under the influence of the British E. Africa Company, and in August 1894 it was declared a British protectorate. While the country is generally healthy, some districts round the great lakes and near the Nile have recently suffered severely from 'sleeping sickness.' See Sir H. H. Johnston's *The Uganda Protectorate* (1902), Lugard's *The Sudd of Uganda* (1900), and Cunningham's *Uganda and its People* (1903).

Uganda Railway, a railway in British E. Africa, constructed from Mombasa on the coast to Port Florence on N.E. shore of the Victoria Nyanza, a distance of 384 m. It was begun in 1896, completed in 1902, and cost over £5,000,000. The highest point it reaches is 5,300 ft.

Uglich, m., Yaroslavl gov., Central Russia, 36 m. w.s.w. of Yaroslavl city, on the upper Volga. An episcopal see, with a cathedral of 13th century; palace of the Czarovich Dmitri, built 1481, restored 1892; 'Dmitri chapel' and 'bell of Uglich.' It is a river port, and has various

manufactures. In 1591 it became famous (May 15) as the scene of the murder of Dmitri, son, and heir of Ivan the Terrible. Pop. (1897) 9,698.

Ugolino della Gherardesca, COUNT (d. 1289), head of a Tuscan family. Dante has made Count Ugolino's treachery immortal. He allied himself with Giovanni Visconti, the leader of the Guelphs, in hope of attaining to sovereignty at Pisa, but failed, and was banished. In 1276 he recovered his possessions. In the naval battle of Meloria (1284), between Pisa and Genoa, he deserted to the Genoese, and caused a complete defeat of the Pisans. Spain fell upon Pisa, and she was compelled to seek Ugolino's aid. He was placed in supreme power, but ruled like a tyrant till a popular uprising deposed him in 1288. He was starved to death in his tower of Gualandi. The Gherardesca family again became important in Pisa in 1316-47. See Del Noce's *Il Conte Ugolino della Gherardesca* (1894).

Ugrian, a term applied collectively to the eastern branch of the Finno-Turki family. Ugrian Finns include the Ostiaks of W. Siberia, the Voguls of the Ural Mts., and the Magyars.

Uhde, FREDERICK CHARLES DE (1848), German painter, born at Wolkenburg, Saxony; went to Paris in 1875, where he studied under Munkacsy. He exhibited several works at the Salon, and also at the exhibitions of 1889 and 1900. Among his most successful religious paintings were *Suffer the little Children to come unto Me* (1884), in the Leipzig Museum; *The Last Supper* (1887), in the Luxembourg; *The Nativity* (1889), in the Dresden Gallery; and *The Walk to Bethlehem* (1890), at Munich.

Uhland, JOHANN LUDWIG (1787-1862), German poet, was born at Tübingen. In 1810 he went to Paris, and studied the mediæval mss. of the *Bibliothèque Nationale*. In 1812 he received a legal appointment at Stuttgart, but gave it up in 1814. From this time onward he took the keenest interest in the political struggles in Württemberg. From 1830-3 he was professor of German literature at Tübingen. Uhland was the head of the Swabian school of poets. The golden period of his poetic career is the decade 1805-14. In it he produced admirable lyrics and very fine ballads, such as *Der blinde König*, *Das Schloss am Meer*, *Der gute Kamerad*, *Der Wirtin Töchterlein*, *Taulefer*, *Des Sängers Fluch*. His dramas, *Ernst, Herzog von Schwaben* (1817), and *Ludwig der Bayer* (1819), are animated by a noble idealism, but are lacking in dramatic move-

ment. Uhland wrote an excellent account of *Walther von der Vogelweide* (1822), and annotated a large number of *Volkslieder* (1844-5). His very valuable *Schriften zur Geschichte der Sage und Dichtung* (8 vols.) were issued in 1865-73. The best edition of the *Gedichte* is that by Erich Schmidt and J. Hartmann (2 vols. 1898). A selection from his books was published by H. Fischer (6 vols. 1892). For his Life, see *Ludwig Uhlands Leben*, by his widow (1874); Karl Mayer's *Ludwig Uhland, seine Freunde und Zeitgenossen* (1867); and J. Hartmann's *Uhlands Tagebuch, 1810-1830* (1896). Long-fellow inserted renderings of several ballads by Uhland in *Hyperion*.

Uhlands, Prussian light cavalry, whose chief weapon is the lance. During the Franco-Prussian war (1870-71) they were used as scouts.

Uigurs, a historical Turki people, who in the 6th century were settled in Kashgaria. At that time they were Buddhists, but soon after were converted to Christianity by the Nestorian missionaries; they are now Mohammedans. The Uigurs have been identified with the Yue-che of the Chinese records, who dwelt in remote times on the Tian-Shan uplands. They have been absorbed by the surrounding Mongol, Chinese, and Tartar populations. Many having taken part in the first Mongol invasions of Europe, their name became widespread as fierce, bloodthirsty monsters, and still survives as the 'ogres' of fable and the nursery. The Uigur language, still current in Kashgaria, is a very pure and somewhat archaic form of Turki, cultivated and formerly written in a peculiar script based on the Syriac of the Nestorian missionaries. See Ch. de Ujfalvy's *Les Ariens au Nord et au Sud de l'Hindou - Kouch* (1896); H. Schott's *Zur Uigurenfrage* (1875).

Uintah, mountain range in N.E. of Utah, U.S.A.; contains Gilbert Peak (13,687 ft.), Emmons (13,694), Mt. Hodges (13,500), and Wilson (13,300). It is traversed by Green R., which has cut a tremendous gorge across it.

Uist. (1.) NORTH, isl., Outer Hebrides, Inverness-shire, Scotland, s.s.w. of Lewis-Harris, separated from Skye by the Little Minch. The main island is 18 m. from s.w. to N.E.; breadth, 14 m. The east part is composed mainly of bogs and lochs. The west is hilly, and towards the coast is well cultivated. The inhabitants are mainly crofter-fishermen. Pop. 2,936. (2.) SOUTH, isl., s. of Benbecula; is 22 m. from N. to s., and 8 m. broad. The east is much indented by sea lochs. Black cattle are pastured in the

uplands; Cheviot sheep are also kept. The inhabitants are crofter-fishermen and mainly Roman Catholics. Pop. 3,515.

Uitenhage, tn. and summer resort, Cape Colony, British S. Africa, 21 m. by rail N.W. of Port Elizabeth; has railway workshops and wool-washing. Pop. 12,000.

Ujiji, or KAWELE, tn., German E. Africa, on E. shore of Lake Tanganyika. Formerly an Arab slave depot, it now carries on trade in ivory. At Ujiji Stanley found Livingstone in 1871.

Ujjain, tn., Gwalior state, Central India, 32 m. N. of Indore, was once the capital of Malwa, and a sacred city. Opium is the chief export. Pop. (1901) 39,892.

U.K., United Kingdom of Great Britain and Ireland.

Ukase, an edict issued either by the Czar of Russia or by the Senate, enjoining legislative or administrative measures. Ukases form the basis of the *svod* or imperial code.

Ukraine, the region of the Middle Dnieper valley, from the marshes of Pinsk to the cataracts below Ekaterinoslav. It was conquered in the 14th century by Lithuania, and was long disputed between this power, Russia, and Turkey. Between 1654 and 1686 all the Ukraine E. of the Dnieper, in 1793 the portion W. of the river, passed under the rule of the Czars.

Ulcer, a breach of continuity of an epithelial or endothelial surface, with a discharge of a purulent character from the exposed tissues. Ulceration may be a part of the process of repair, or, on the other hand, a part of the inflammatory reaction of the tissues after the application of an irritant; but many chronic weak or indolent ulcers exhibit neither progress towards recovery nor further destructive change. In all ulcers the surrounding blood-vessels are dilated, and serum and corpuscles exude from the capillaries into the tissues and upon the floor of the ulcer. An important form of ulcer is that known as bed sore. (1.) Healing ulcers require locally rest and protection from irritation. In very extensive ulcers skin-grafting may be necessary. (2.) In spreading ulcers the source of irritation must be removed, and the surface of the ulcer should be rendered aseptic. The inflamed surrounding tissues may be scarified, or leeches may be applied. When the inflammation is subdued, the treatment is that of a healing ulcer. (3.) In chronic ulcers the induration must be got rid of by strapping, by blisters, or by elastic bandages. Antiseptic lotions and ointments are also useful. Chronic weak

ulcers frequently improve after the application of caustic and astringent lotions. Iron, quinine, and nux vomica should also be administered. In all ulcers of the lower limbs recovery is hastened if the leg be raised. Syphilitic, tubercular, and malignant ulcerations must be treated as parts of the diseases to which they are due.

Uleåborg. (1.) Province, Finland, between Norway (to N.) and Sweden and the Gulf of Bothnia (to W.). Area, 63,957 sq. m.; pop. (1897) 268,226. It drains to the Arctic Ocean, the White Sea, and the Gulf of Bothnia. The chief rivers are the Muonio, Torneå, Kemijoki, and Uleå. Lakes are numerous and extensive. (2.) Town and seapt., Finland, cap. of Uleåborg prov., at the mouth of the Uleå, and on the Gulf of Bothnia, in 65° N. lat.; with mills, shipbuilding yards, manufactories of tobacco, salmon-fisheries. It exports timber, hides and leather, pitch and tar. Uleåborg was founded in 1570. Pop. (1897) 14,540.

Ulema, the general body of learned men in Mohammedan countries. They are the interpreters of the Koran, and consequently of the law. Thus from them are taken the interpreters of the laws, the principal mollahs, cadis, nazibs, muftis, and sheiks. The Sheikh-ul-Islam is the president of the Ulema.

Ulex, a genus of hardy spring shrubs belonging to the order Leguminosæ. They bear yellow flowers, either solitary or showily racemose. See *FURZE*.

Ulpilas, **ULPHILAS**, or **WULFILA** (c. 311-381), translator of the Bible into Gothic, was of Goth birth, and was consecrated missionary bishop to the West Goths by Eusebius of Nicomedia (341). His translation (ed. Bernhardt, 1875), of which portions only exist, is the oldest extant literary monument in any of the Germanic languages. See C. A. Scott's *Ulpilas, Apostle of the Goths* (1885).

Uliassutai, or **ULIASSUTAI**, tn., N. Mongolia, cap. of the whole country, 1,100 m. to N.W. of Peking, in 47° 44' 27" N. lat., 96° 51' 1" E. long. It is divided into a mercantile and an official town. Most of the people are Chinese. Pop. about 4,000.

Ullmann, **KARL** (1796-1865), German Protestant theologian, born at Effenbach, near Heidelberg; was professor at Heidelberg (1821-9), Halle (1829-36), and again at Heidelberg (1836-56), where he became the leader of a 'mediation school' of theology. His works include *Reformers before the Reformation* (1841; Eng. trans. 1841-2), *The Sinlessness of Jesus* (1841; Eng. trans. 1870), *Das*

Wesen des Christentums (1849), and a reply to Strauss's *Life of Jesus*. See *Beyschlag's Monograph* (1867).

Ullswater, lake, the second largest in England, between Cumberland and Westmorland. Aira Force (80 ft.) falls on W. side. Length, 7½ m.; average breadth half a mile.

Ulm, riv. port and fortified tn. in E. Württemberg, Germany, on l. bk. of Danube, 45 m. E.S.E. of Stuttgart; is connected with New Ulm, Bavaria, by two bridges. Tobacco, cement, machinery, linen and cotton goods are manufactured. Ornamental pipe-bowls and Ulm bread are characteristic products. The Late Gothic cathedral (1377) is second in Germany to that of Cologne, and its tower, completed in 1890, is 528 ft. high. Ulm was an important trade centre in the late middle ages. Here, in 1805, the Austrian general Mack capitulated with about 30,000 men to the French. Pop. (1900) 42,982.

Ulmus, a genus of hardy trees belonging to the order Urticacæ. See *ELM*.

Ulpilas. See *ULFILAS*.

Ulpian, or, in full, **DOMITIUS ULPIANUS** (fl. 220 A.D.), Roman jurist, was descended from a Phœnician family; banished by Elagabalus in 217; in 222, on the accession of Alexander Severus, he became that emperor's chief adviser, prefect in charge of the corn supply, and prefect of the prætorian guards. He was murdered in 228 by soldiers. He wrote from fifteen to twenty works on law, from which many excerpts are made in the *Digest* of Justinian.

Ulrich von Hutten. See *HUTTEN*.

Ulrici, **HERMANN** (1806-84), German philosopher and critic, was a native of Pforten in Lusatia, and became a magistrate at Frankfurt, receiving the professorship of philosophy at Halle (1834). As a Shakespearean critic, he is chiefly known by his *Shakespeare's Dramatic Art* (Eng. trans. 1846); but he also wrote *Geschichte der hellenischen Dichtkunst* (1835), *Das Grundprinzip der Philosophie* (1845-6), *Gott und die Natur* (1862), *Gott und der Mensch* (1866-73).

Ulrika Leonora, the elder, queen of Sweden (1656-93), was a daughter of Frederick III., king of Denmark, wife (1680) of Charles XI. and mother of Charles XII. of Sweden.

Ulrika Leonora, the younger, queen of Sweden (1688-1741), daughter of Charles XI. and sister of Charles XII., lived in retirement till 1713-14, when the Riksdag appointed her regent during her brother's absence. In 1715 she married Prince Frederick of

Hesse, and in 1719 was elected queen of Sweden. On Feb. 29, 1720, she abdicated in favour of her husband.

Ulster, prov. in the north of Ireland, comprising Belfast city, and counties Donegal, Londonderry, Antrim, Down, Armagh, Tyrone, Monaghan, Cavan, and Fermanagh. The province is the most flourishing in Ireland. Flax is grown, and contributes part of the raw material for the linen manufacture, the staple industry of the north-east. There are shipyards at Belfast. Other industries are muslin embroidery (domestic) and whisky distilling. Iron, alum clay (bauxite), and rock salt are worked in Antrim; also building and lime stone, brick and fire clays, and china clay (Fermanagh). In the time of James I. over half a million acres of confiscated land were portioned out among English and Scottish settlers; this is known as the Plantation of Ulster. Later, many of Cromwell's soldiers were settled in the country. Area, 8,613 sq. m. Pop. (1901) 1,582,826.

Ult. (*ultimo*), in the last month.

Ultimus Hæres, in Scots law, the crown as ultimately entitled to the property, both heritable and movable, of all persons who die intestate, and either have no heirs—as in the case of a bastard who leaves no legitimate descendants—or whose heirs cannot be found. In England, the passing of real estate to the crown on intestacy without heirs is regarded as a case of escheat, and the rights of the crown both to real and personal property are regulated by the Intestates Estates Act, 1884.

Ultor, 'the Avenger,' a title of the Roman god Mars. Augustus built a temple to him in the forum at Rome, after defeating the murderers of Julius Cæsar.

Ultramarine appears to be a silicate of sodium and aluminium, with sodium polysulphides, and was originally obtained by grinding up lapis lazuli, but is now prepared artificially. A mixture of 100 parts pure china clay, 90 of sodium carbonate, 20 of charcoal, and 110 of sulphur, with sometimes free silica in addition, is heated in crucibles or muffles for some weeks. The product, when sorted, ground, and washed, is of fine blue colour, and is permanent except when acted on by acids. A green ultramarine containing a greater proportion of sodium is also prepared, and is convertible into the blue variety by heating with additional sulphur. Blue ultramarine is used as a pigment, for paper-staining, and also to counteract the yellowish tint of paper and laundry work.

Ultramontane, meaning 'over or beyond the mountains' (*i.e.* the Alps), is a term expressive of the views of the ultra-papal party, which maintains the dogma of the pope's infallibility, and all other papal prerogatives, in their most stringent interpretation.

Ultra Vires strictly means 'beyond the powers,' and the term is used in cases where a person or officer acts in excess of his jurisdiction or authority—*e.g.* if a recorder tries a case only triable at assizes. But the term is usually applied to the case of companies or corporations exceeding their powers. A company acts 'ultra vires' (1) if it exceeds the powers conferred on it by its memorandum of association; or (2) if it does acts which no company, or which no company of its class, may do—*e.g.* pays dividends out of capital, or reduces its capital without the leave of the court; or (3) if it does acts forbidden by the act under which it works—*e.g.* purchases property not required for its undertaking, delegates its powers, etc. Ultra vires agreements are void *ab initio*. Ultra vires acts may be restrained by injunction or information by the attorney-general.

Ulundi, vil., Zululand, 110 m. N.E. of Pietermaritzburg. Here Lord Chelmsford defeated the Zulus under Cetuywayo (1879).

Ulverston, mrkt. tn., Lancashire, England, 8 m. N.E. of Barrow; centre of iron industries. Conishead Priory (now a hydropathic) lies 1½ m. S.E. Pop. (1901) 10,064.

Uluar. See ALWAR.

Olysses, or ULIXES, the Latin form of Odysseus. See ODYSSEUS.

Umá, in Hindu mythology, a name of the goddess Kali, a consort of Siva. She is also known as Deva and Durgá, and is a popular object of worship among the Hindus.

Uman, tn., Kiev gov., S.W. Russia, 115 m. S. of Kiev city, with an agricultural college, and manufactures of tobacco, malt, candles, bricks, vinegar; has tanneries, breweries, distilleries, flour mills, iron foundries. Pop. (1897) 28,628, largely Jews.

Umballa, or AMBALA, city, cap. of dist. of same name, Punjab, India, 54 m. S.W. of Simla, an important railway junction and cantonment. Pop. (1901) 78,638. The district has an area of 1,851 sq. m., and a population (1901) of 815,880.

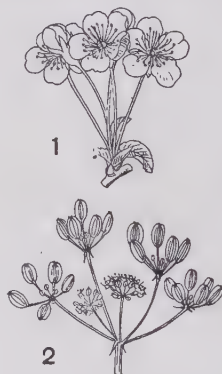
Umbel, an inflorescence, in which all the flowers are borne upon pedicels of equal length arising from a common centre.

Umbelliferae, a natural order of mostly herbaceous hardy plants, which bear usually umbels of small flowers with five petals, five sta-

mens, and inferior, two-celled ovary. The fruit is composed of two dry, ridged carpels, adherent to a central stalk. The carrot, parsley, parsnip, celery, fennel, and chervil are among the useful plants contained in this order. Among the genera are Myrrhis, Apium, Peucedanum, Conium, Eryngium, Carum, Pimpinella, Ethusa, Angelica, Heracleum, Daucus, Sium, Smyrnium, and Charophyllum.

Umbel is composed of hydrated ferric and manganese oxides, with variable proportions of earthy matter. It is used as a brown pigment both when 'raw' and calcined. The latter, or 'burnt' umber, is of a warmer colour.

Umbilical Cord. See FÆTUS.



Forms of Umbel.

1. Simple (cherry). 2. Compound (parsnip).

Umbrella, a portable protection against sun or rain, made of silk, cotton, alpaca, gingham, or other materials, extended on a framework of steel, supported by a wooden handle or stick. It was known in China in the 11th century B.C.; discovered by Layard at Nineveh, with tasselled edge and flowered top, and by Sir J. G. Wilkinson at Thebes (Egypt). In Burma the king and the white elephant were alone permitted white umbrellas, descending gradations of rank being marked by yellow, golden, red, green, and brown. The Maratha princes were also 'lords of the umbrella.' In Italy the doge of Venice in the 12th century had a state umbrella, which, as akin to the baldachin, was also assigned to cardinals of basilican churches. Known in England in Anglo-Saxon times, mentioned by Drayton (1620), Swift (*City Shower*, 1710), it was assigned in Queen Anne's reign to women. Jonas Hanway (1712-86), the Persian traveller, was a pioneer in the use of the umbrella. In Scotland it was introduced by an Edinburgh surgeon (1780), and

used in Glasgow (1781-2) by John Jamieson, also a surgeon. Alpaca, patented by William Sangster (1848), and paragon ribs, by Samuel Fox (1852), are notable developments of an industry carried on at London, Manchester, Glasgow, Paris, Angers, Lyons, where and at Crefeld the silk is chiefly made. See *Gentleman's Magazine* (1889).

Umbrella Bird (*Cephalopterus ornatus*), a bird belonging to the same family as the chattering, remarkable for its large umbrella-like crest, and for the bunch of long feathers on the under surface of the neck. The plumage is glossy black, and the bird is confined to the upper Amazons region.



Umbrella Bird.

Umbrella Tree, the popular name given to trees of several genera from the radiating nature of the leaves, specially to several species of *Magnolia*.

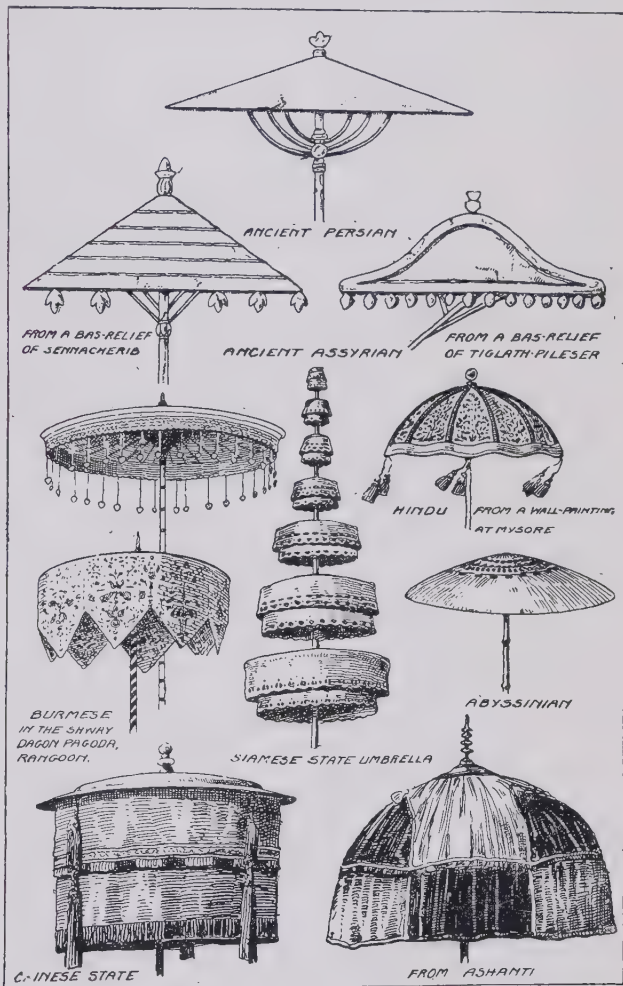
Umbrette (*Scopus umbretta*), a bird apparently related to the storks, which is found in Madagascar and parts of Africa. The general colour is purplish brown, and the head bears a large erectile crest; hence the name of hammer-head sometimes applied to the bird.

Umbria, a division of ancient Italy; lay E. of Etruria. The Umbrians fought with the Etruscans against Rome in the 4th century B.C., but were seriously defeated in 308 B.C., and submitted to Rome. In 296 they rose again with the Etruscans and Samnites, but were finally conquered at the battle of Sentinum in 295 B.C., and thenceforward were faithful allies of the Romans. In 90 B.C. they received the Roman franchise. From the fragments known of the language—preserved chiefly in the tablets of the Iguvium or Eugubine Tables found (1444) at Gubbio and preserved there—it appears that they were closely akin in race to the Latins and

Oscans. They appear to have been largely a pastoral people. See EUGUBINE TABLES; also Hutton's *The Cities of Umbria* (1905) and Macquoid's *Pictures in Umbria* (1905).

Umlaut, a word invented by Jacob Grimm, is a technical term in German philology for which 'vowel mutation' may be em-

are *Mann, männlich; Erde, irdisch; Gott, göttlich; and Kunst, künftig*. In English the same vowels under the same influence mutate to *e, i, y* (or *ë*), and *y* respectively. The examples are very numerous, but not at all obvious, because (1) the vowel which caused the change seldom survives, (2) the mutated vowel



Umbrellas.

ployed in English (Sweet, Skeat). The name is used to denote vowel transformations caused by the influence of other vowels standing in the next syllable. The German vowel mutations, being later in date, are more easily traced. *A, e, o, and u* in German, under the influence of *i*, mutate to *e, i, ö, and ü* respectively. Examples

itself has frequently undergone further change. *Frank* gives *French* through the intermediate stage of Frankish; the old termination *ish* explains the change from *a* to *e* (cf. *English* from *Angle*). Similarly, *fore* gives *first* (= *fyrst*=*forist*). What are called mutation plurals—*men, mice* (= *mys* = *mysis*), *feet*, etc., from

man, mouse (=mus), *foot* (=fōt), etc., are explained in this way. The old plural ending which led to the mutation has been lost. These *i* and *u* mutations of English and German are clear instances of the way in which sound change in all languages proceeds according to fixed law. See Skeat's *Principles of English Etymology*, First Series (1887), chap. xi. (English vowel mutation only), and Victor Henry's *Grammaire Comparée de l'Anglais et de l'Allemand* (1893), pp. 46-52.

Umpire. See ARBITRATION.

Umrer, munic. tn., Nagpur dist., Central Provinces, India, 25 m. S.E. of Nagpur; manufactures fine cotton cloth. Pop. (1901) 15,943.

Umreth, tn., Kaira dist., Bombay Presidency, India, 28 m. N. of Baroda. Pop. (1901) 15,549.

Umritsar. See AMRITSAR.

Unalaska. See ALEUTIAN ISLES.

Unao, chief tn. and municipality of Unao dist., United Provinces, India, 12 m. N.E. of Cawnpur. Pop. (1901) 13,109. The district has an area of 1,737 sq. m., and a population (1901) of 976,639.

Uncial Letters. See PALÆOGRAPHY.

Unclaimed Dividends. Under the Companies Winding-up Rules, 1890, dividends in the hands of a liquidator winding up a company, unclaimed for six months, are paid into the Companies Liquidation Account at the Bank of England, and may be paid out to the persons entitled on petition to the Board of Trade. By the National Debt Act, 1870, all government stock whereon no dividend has been claimed for ten years is transferred to the National Debt Commissioners; but if any person can show a title, it may be retransferred by the governor of the Bank of England, on his refusal, by order of the Court of Chancery. Lists of unclaimed dividends must appear periodically in the *London Gazette*.



Cliff showing unconformity of Strata.

Unconformity, or UNCONFORMABILITY, in geology, is marked by the junction of two sets of strata which usually have different dips.

Unconsciousness should properly denote the absence of consciousness in a being capable of it, as in sleep or coma; but it is also used in other less appropriate ways to signify (1) absence of attention or full consciousness—a usage for which psychologists now prefer to substitute the more accurate term *subconscious*; and (2) absence of reflection, as when we say that a man really holds or acts upon a principle, although he is not conscious of it. The term has also been used in a metaphysical sense by Von Hartmann to denote man's supposed deeper principle, of which consciousness is only a manifestation. Unconsciousness may be physiological, as in normal sleep; pathological, as in cerebral hæmorrhage; or toxic, as in chloroform anæsthesia; but rigid distinctions cannot always be drawn, since sleep is sometimes pathological, and many of the toxic forms of unconsciousness are due to the products of disease. The condition may be partial or profound. In absent-mindedness some of the special senses display diminished activity, and fail to respond to ordinary stimuli. In profound unconsciousness the mental processes are completely in abeyance. Pathological unconsciousness may be produced by syncope, in which condition the brain is rendered anæmic, or it may be caused by asphyxia from interference with respiration, or again it may be due to disturbances of the nervous system. Shock produces an unconsciousness similar to that of syncope. Direct injuries to the brain, such as concussion, laceration, and compression, may also abolish consciousness; and certain nervous disorders, such as epilepsy and hysteria, are frequently the cause of varying degrees of unconsciousness. Toxic unconsciousness may be produced by poisons manufactured within the body. These are as a rule waste products, and the unconsciousness of asphyxia is due in part at least to excess of carbon dioxide in the blood. Opium and chloroform are drugs which produce varying degrees of unconsciousness according to the dose administered, and to the idiosyncrasy of the recipient.

Unction. See EXTREME UNCTION.

Underground Dwellings. Early Japanese records speak of an aboriginal people known as 'earth-hiders,' who inhabited subterranean abodes. A dwelling of this kind 'was unearthed near Akita in Dewa (in the N.W. of Nippon) in 1807. Chinese, Japanese, and Koreans may all be pit-dwellers on occasion, and the practice is by no means confined to this part of the world' (Aston).

The Russians describe a now extinct people in southern Kamchatka, swarthy, undersized, and Mongolian in type, whose regular winter dwelling was 'an underground retreat known as a yurt, entered by means of a notched pole (as ladder), downwards through a hole in the roof.' From Kamchatka to the White Sea the underground dwelling seems peculiarly to denote a Mongoloid people. In the Aleutian archipelago the inhabitants, 'especially in their winter villages, were used to construct large, half-underground habitations, often of extraordinary size. These were so arranged by internal partitions as to afford shelter to even as many as one hundred families. No fires were built in the central undivided portion, which was entered through a hole in the roof, provided with a notched log by way of ladder.' (W. H. Dall, *Smithsonian Contributions to Knowledge*, 318, Washington, 1878.) The descriptions given by Ross and Scoresby of the N. Greenland underground dwellings closely coincide with the Aleutian accounts. Several of these underground dwellings might be aptly placed under the heading of MOUND DWELLINGS, for the one form merges into the other. In Europe we find several varieties of subterranean abodes, of which the most interesting is the megalithic cyclopean structure, usually in the shape of a long, curved gallery, wholly underground. Examples of this kind of building are found in France and the Netherlands; and there are also constructions of a kindred nature in Germany. But Ireland and Scotland possess, or have at one time possessed, an immense number of these structures, of which there are also some in Cornwall. Apparently the largest ever known is that at Piteur, near Coupar-Angus, Forfarshire, of which the main gallery is about 190 ft. in length, its average width and height being six feet. Some of the Irish souterrains have the passage partially blocked at certain points, obviously with the view of placing an intruder at the mercy of the inmates. At Tankerness, Orkney, a specimen having the roof supported by stone pillars was discovered as lately as May 1906. The articles commonly found in the Irish and Scottish souterrains are domestic utensils, such as stone hand-mills, pottery, and implements of bone, bronze, and iron.

Underground Railroad, a secret philanthropical organization, which existed in the United States and Canada during the later years of slavery in the former country, its object being to

aid slaves to escape from bondage. Its chief centre was in Philadelphia; it took form about 1838, and Levi Coffin, a Quaker, was prominent in its early history. See Hope's *Heroes in Homespun* (1894).

Underground Railway. See RAILWAYS.

Under-sheriff. See SHERIFF.
Understanding is used in our older philosophical literature to denote the human mind generally, as in the title of Locke's *Essay concerning Human Understanding*; and more particularly the intellectual faculties, in contrast with the emotions and will, as in the title of Hume's *Inquiry con-*

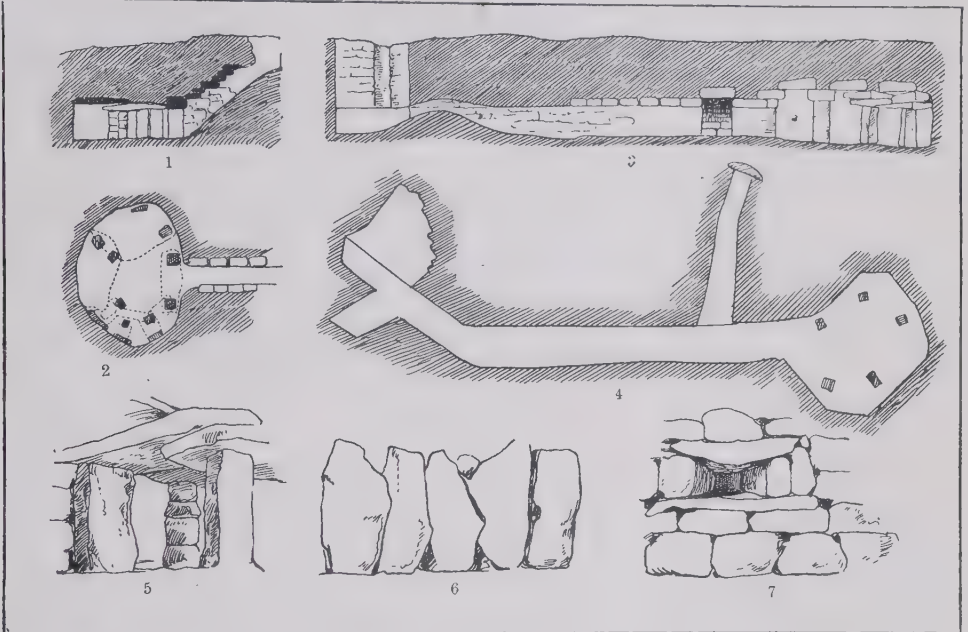
the root remaining perfect from which the shoots are cut, and producing new shoots, and so yielding a succession of profits.'

Underwriter. See INSURANCE (MARINE), LLOYD'S.

Undine, a female water-sprite, without a soul, which, however, she might obtain by giving herself in marriage to a mortal and bearing a child to him. Baron de la Motte Fouqué's novel entitled *Undine* (1814) illustrates this peculiarly Paracelsian idea.

Undue Influence. (1.) Where a parent or guardian obtains an advantage from a child, a solicitor from a client, a trustee from his beneficiary, or where any

employed was proposed by the bishops of London, Rochester, and Bedford, Cardinal Manning, Mr. Spurgeon, and Mr. Reaney; and in the following year Lord Mayor de Keyser advocated a scheme for the employment of the London poor in making open spaces, gardens, and recreation grounds. In 1888 a deputation to Lord Salisbury recommended public works, inquiry, and registration, state-aided emigration, and prohibition of alien pauper immigrants. In 1893 a manifesto was issued by the Central Unemployed Organization Committee, stating that the unemployed numbered nearly two



Details of Underground Dwellings.

1, 2. Plan and section, simple type of underground dwelling, Pierowall, Orkney. 3, 4. Plan and section, dwelling at Saverock, Orkney. 5. Roof construction, overlapping stones supported on piers. 6. Wall construction, Murroes, Angus. 7. Wall construction and recess, Crichton Mains.

cerning Human Understanding. In current philosophical literature it is little used, except in connection with the Kantian distinction between understanding and reason, in which the former may be said, roughly speaking, to denote scientific thought, with its mechanical categories of cause and substance; the latter, philosophical thought, with its higher categories of end and system.

Underwood, in English law, means wood which may be cut without injury. A tenant for life may cut it without committing waste. It has been judicially defined as 'wood which grows expeditiously and sends up many shoots from one stool,

special confidential relation exists, such as that of doctor and patient, confessor and penitent, it is for the person exercising the influence to show that the other party fully understood what he was doing, and was a free agent, and the court will generally set aside the transaction, unless it is shown that the party had independent advice. (2.) As to wills, the presumption is always against undue influence, and in order to upset a will it is necessary to prove an amount of influence almost extending to coercion.

Undulatory Theory. See OPTICS.

Unemployed. In 1886 a plan for providing work for the un-

millions, and demanding legislation for the exclusion of foreigners, prevention of sweating, amendment of the poor laws, grants for public works, etc. Since that time there have been numerous processions and demonstrations of the unemployed (and their wives and children) in Hyde Park, Trafalgar Square, and elsewhere. In 1895 a select committee of the Commons was appointed, with Sir Henry Campbell-Bannerman as chairman. Their reports led to nothing practical; but in 1905 Mr. Gerald Balfour succeeded in passing the Unemployed Workmen Act, by which, all over the country, 'distress committees' were appointed

under the control of the Local Government Board to receive and inquire into applications from the unemployed, and assist them to obtain work. This act, combined with the fund raised by Queen Alexandra, has given a large amount of assistance in the relief of the unemployed in every part of the country. The expenses incurred by the act are defrayed out of a fund under the management of the central body, supplied by voluntary contributions, and by contributions 'made on the demand of the central body by the councils of each metropolitan borough,' so far as London is concerned, with modifications in regard to the rest of England, Scotland, and Ireland. The relief has been greatly assisted by the establishment of 'industrial settlements,' 'agricultural settlements,' and 'rural colonies.' See *Problem of the Unemployed* (1903), Higgs's *How to Deal with the Unemployed* (1904), Alden's *The Unemployed* (1905), Sutter's *A Colony of Mercy* (1901), Hobson's *Problem of the Unemployed* (1896), Divine's *Principles of Relief* (1904), *Report on the Agencies and Methods for Dealing with the Unemployed* (1893), and *Unemployed Relief Work* (London), a parliamentary paper issued by the Local Government Board, June 1905.

Ungava, territory (since 1897) of Canada, occupies the Labrador peninsula, except the S. and E., and covers an area of 349,109 sq. m. In the S. are extensive forests, but towards the N. there is a gradual approach to tundra conditions. Iron ore is abundant. The inhabitants are mainly Indian hunters. (Pop. 1901) 5,113.

Unger, FRANZ (1800-70), Austrian botanist, was born near Leutschach in Styria. He became professor of botany at the Polytechnic Institute of Graz in 1836, and at Vienna in 1850. He was also an authority on palaeontology. See *Life* in German by Reyer (1871).

Unger, JOSEPH (1828), Austrian jurist and politician, born in Vienna; became professor of law at Prague (1853), in Vienna (1857), and was a minister of the Auersperg cabinet (1871-9). He wrote *System des Oesterreichischen Allgemeinen Privatrechts* (1894), *Die Verträge zu Gunsten Dritter* (1869), *Sammlung von Zivilrechtlichen Entscheidungen* (1873), *Schuldübernahme* (1889), and *Handeln auf fremde Gefahr* (1891).

Ungulata, or **HOOFED MAMMALS**, a large order, including a great variety of forms. The toes are never provided with claws, and usually bear hoofs; the clavicles are always absent, and,

except in the elephant, no living form has five functional toes. The more typical ungulates are included in the two suborders Artiodactyla and Perissodactyla; but the order also includes the aberrant elephants, or Proboscidea, and the Hyracoidea.

Ungvár, tn., cap. of co. Ung, Hungary, on the Ung. 48 m. E.S.E. of Kashau; with manufactures of pottery, and a trade in wine and timber. There is also a mineral spring. It is a see of the United Greek Church. Pop. (1900) 14,723.

Uniats, or **UNITED GREEK CHURCHES**, in communion with Rome. The Roman propaganda in the East has been successful in securing the adhesion of various isolated Greek communities, to which special privileges have been granted on condition of their obedience to the papal authority. Thus, marriage is permitted to the priesthood, communion in both kinds is granted to the laity, and each church is allowed to use its own peculiar customs and liturgy. The Greek, Melchite, Bulgarian, Ruthenian, Maronite, Syro-Chaldaic, Coptic, Armenian, and Roumanian rites all receive the sanction of Rome in connection with the Roman-Eastern churches to which they belong. In their case the Latin tongue is not required in the liturgy; Slav, Syriac, and Greek are approved, and even Arabic is tolerated.



Unicorn (heraldry).

Unicorn, a mythical creature resembling a horse, with a straight horn in the middle of its forehead, the legs of a buck, and the tail of a lion. In the Hebrew Bible the unicorn probably means a species of buffalo. James I. substituted a unicorn, one of the supporters of the royal arms of Scotland, for the red dragon of Wales, introduced by Henry VII. into the royal arms of England.

Uniform. (1.) **MILITARY**.—In the early days of the standing army officers and men were clothed in the ordinary garb of the period. The officer who raised the corps usually determined its dress. The colour of the king's livery being scarlet, the coats of the army became after a time almost universally scarlet, while the distinctive facings or linings of regiments were usually the colour of the liveries of their original colonels. As the king's liveries were lined with blue, that became the colour of the facings of the guards and other royal regiments. As time went on greater uniformity was established between the various regiments of the same arm. The original long coat of the late Stuart period, with square, voluminous skirts, was found cumbersome. The corners of the skirts were therefore often fastened back to buttons behind, and ultimately the coat was shaped in this cut-away style, which was worn, much modified, up to the time of the Crimean war. The cavalier slouched felt hat, with brim looped up, gradually stiffened into the hard three-cornered article, and then became the cocked hat. The knee-breeches, formerly universal, lingered in the army after they had been generally discarded in civil life for trousers. The Crimean war dealt the first severe blow to the *régime* of pipeclay, leathern stocks, and unserviceable show. The Indian mutiny showed the folly of wearing European uniforms in India, and soon afterwards special clothing of light serge and of cotton drill was issued to the soldier for wear in the tropics. The Royal Artillery has always worn blue, with scarlet facings. The Royal Engineers originally wore scarlet, with blue facings. They were then, in 1787, put into blue, with black velvet facings. In 1813 they reverted to the scarlet, with blue velvet. The Highland uniform first appeared in the British army in 1739. Up to 1759 the cavalry had consisted simply of the household regiments, the dragoon guards, and the dragoons—all wearing scarlet, except the Royal Horse Guards. Some of the dragoon regiments were now converted into 'light dragoons,' and were given a blue uniform. In and after 1805, some of the latter were transformed into 'hussars,' and were clad in the Hungarian dress peculiar to the troops so called. The original dolman or pelisse was lined with fur. The bushy, which is the hussar head-dress, was originally a comfortable, soft, pointed cap of cloth, surrounded by a broad band of fur; it has become a hard, cylindrical, fur-covered box, with a

strip of cloth stiffly stretched down one side and there hooked. In 1815 some regiments of light dragoons were converted into 'lancers,' and given the distinctive Polish uniform which is the mark of lancers or uhlands. The lancer regiments were originally all clad in blue. The rifle regiments, so called from their having been the first to which rifles were given during the Peninsular war, were first dressed in dark green. In 1830-1 William IV. dressed all the light dragoons and lancers in scarlet. In 1842 the light dragoons and lancers were again put into blue uniforms, excepting the 16th Lancers, which has remained in scarlet up to the present time.

The tunic was gradually substituted for the coatee in the dress of all corps, except the Highlanders and the Horse Artillery. In 1861 the remaining light dragoon regiments also became hussars. The dragoon guards and dragoons exchanged their cocked hats for metal helmets in 1820, when the household cavalry were also given cuirasses. The original crested helmets were later changed for those of the present pattern. The old three-cornered hat, worn by the infantry in the 18th century, had given place about its end to the shako, the foot guards and fusilier regiments wearing a pointed bearskin cap. The shako was abolished in 1876 for all but non-kilted Highland regiments (who wear it still), and a spiked cloth helmet was adopted in its stead. The garrison and the field artillery were given similar helmets, but with a ball instead of a spike. The Rifles afterwards received an astrakhan bushy, which has since been modified into a soft astrakhan cap.

Frocks of kersey, serge, or cloth originated in the light serge frocks worn in India. They were adopted as a fatigue dress in the infantry in 1870. The use of the frock spread some years later to the engineers and artillery; but the cavalry clung to the stable jacket until quite recently. The cavalry wore breeches and boots in the Peninsular war, but after the peace received trousers (or 'overalls,' as they are technically called). In 1872 the overalls gave place to breeches (or 'pantaloon') and long boots.

In 1881, the infantry having been reorganized into territorial regiments, facings were prescribed on a new principle, according to which all royal regiments retained blue facings; while non-royal regiments in scarlet wore white facings if English or Welsh, yellow if Scottish, and green if Irish. More recently this principle has been abandoned, and

their original facings restored to regiments which desired it. The war which broke out in S. Africa in 1899 led to the whole force which was sent to that country being clothed in a fighting dress of khaki, which has now been adopted as the permanent working dress of the army.

Military Badges.—These are worn to denote either proficiency in some special branch in the case of the rank and file, or rank in the case of officers. Officers' badges are worn on the collar, shoulder-strap, or sleeve, and are as follows:—Second lieutenant, one star; lieutenant, two stars; captain, three stars; major, crown; lieutenant-colonel, crown and one star; colonel, crown and two stars; brigadier-general, sword and baton; major-general, baton and sword surmounted by a star; lieutenant-general, sword and baton surmounted by crown and two stars; general, sword and baton surmounted by crown and three stars; field-marshal, crossed batons in a wreath of laurel surmounted by a crown. The proficiency and other badges are—colour-sergeant, crossed colours; pioneer, crossed axes; farrier, spur; wheelwright, wheel; marksman, crossed rifles; signaller, crossed signalling flags.

(2.) NAVAL.—Henry VIII. assigned to the men of the Cinque Ports fleet for their uniform 'a cote of white cotyn with a red crosse, and the arms of the portis underneath.' Under the early Tudors the usual dress of seamen was green and white, green being the colour of the Tudor livery. The green became scarlet in 1604 under James I. The kilt and trousers are commonly seen in pictures representing seamen's dress from the 16th to the 18th century. These garments were ordinarily made of canvas. There was still, however, no uniform, although no doubt a certain amount of uniformity was secured by the practice, dating from the time of the restoration or earlier, of officially prescribing the materials and patterns of the slop-clothing which was supplied to pursers for sale at sea to their ships' companies. In 1706 the slop clothing of regulation pattern was a red and gray costume, which lasted until about the middle of the 18th century, when green and blue baize frocks were introduced. The ordinary dress of the period for seamen was a small cocked hat, a pea-jacket, a pair of petticoat trousers like a kilt, stockings, and shoes with pinchbeck buckles. About 1780 the cocked hats went out of use, and woollen or fur caps and soft hats took their place. In 1748 uniforms for naval officers were first introduced. During the

French wars the seaman's dress generally consisted of a blue jacket, white trousers, and tarpaulin hat. On Jan. 1, 1825, new regulations for officers' uniform were issued, and an approach was made to the uniforms of the present day. The seamen's uniform was at length established nearly as it now is in 1857, and since 1891 uniformity has reigned in all ranks and ratings. In 1879 the ship jacket was instituted, with buttons on the sleeves. In 1889 a monkey jacket took the place of the blue tunic. Nowadays officers and men may be clean shaven, or may wear side whiskers, or may grow whiskers, moustaches, and beard, if these be kept cut close to the face. For the tropics a white uniform is worn for review order, and ducks generally.

Naval Badges.—Badges are the distinctive decorations worn by petty officers, men, and boys, on account of rating, good conduct, and special qualifications in regard to their duties. In regard to badges of rating, a first-class petty officer wears on his left arm a crown above crossed anchors; a second-class petty officer, a crown above an anchor; a leading seaman or shipwright, an anchor. Good-conduct badges are also worn upon the left arm. In regard to special qualification badges, the devices are worn on the right arm. A torpedo man, for instance, wears a crossed gun and torpedo; a signalman wears crossed flags; a marksman wears a rifle or crossed rifles, or crossed rifles and star; a gymnastic instructor wears crossed clubs and a crown; a stoker wears a propeller; armourers wear a gun, and crossed axe and hammer; blacksmiths, carpenters, and shipwrights wear a crossed hammer and axe. Chief petty officers and engine-room artificers wear no badges; they are recognized respectively by the gilt buttons worn by the former down the front of their long jackets, and by the latter on the sleeves.

Although not known technically as such, the term badges is often applied to the distinctive marks by which the commissioned officers are known from one another. These decorations consist of devices on the top of the epaulettes, lace bands on the cuffs of uniform coats and jackets, and shoulder-straps on greatcoats. Flag rank is denoted by a crossed baton and sword. In addition to cuff and epaulette decorations, naval officers may be distinguished in full-dress uniform by the white pointed sashes worn on the sleeves.

Uniformitarian. See CATA-CLYSMAL ACTION.



British Military Uniforms.

1. Officer of horse, 1682. 2. Dragoon, 1751. 3. Hussar, 1822. 4. Dragoon, 1832. 5. Lancer, 1906. 6. Musketeer, 1687. 7 to 14. Infantry privates, 1742, 1792, 1812, 1832, 1854, 1882, and 1906.



British Naval Uniforms.

1. Officer, 1704. 2. Seaman, 1760. 3. Seaman, 1750. 4. Seaman, 1802. 5. Officer, 1802. 6. Seaman, 1854. 7, 8. Officer, seaman, and chief petty officer, 1900.

1 2 3 4 5 6 7 8 9

Uniformity, ACTS OF. These are acts intended to ensure the uniformity of public worship in the Church of England. The earlier acts also enforced compulsory attendance at church services, but these provisions are either repealed or obsolete. The acts at present in force are those of 1548, 1551, 1558, 1662, and 1872. The 1548 act orders clergy to use the Book of Common Prayer under penalty of six months' imprisonment and one year's forfeiture for the first offence, deprivation and a year for the second offence, and imprisonment for life for the third offence. To deprave or despise the Book of Common Prayer by plays or songs is punishable with imprisonment for life on the third offence. The Act of 1558 re-enacts the Act of 1548, applying it to the new Elizabethan Prayer Book: the thirteenth section contains the celebrated 'Ornaments' clause, ordering such ornaments to be retained as were in use in 1548, subject to alteration by the queen under the Great Seal. The Act of 1662 ordains a new Prayer Book, orders morning and evening prayer to be read daily; but Latin prayers may be read at the universities, 'Westminster, Winchester, and Eton,' and a Welsh translation in Wales. The Act of 1872 authorized a shortened form of service except on feast days, and *special* forms of service if approved by the ordinary.

Unigenitus. See JANSENISM.

Union. See SCOTLAND—*History*, and POOR LAW ADMINISTRATION.

Union, tn., Union co., New Jersey, U.S.A., 4 m. N.W. of Elizabeth. Pop. (1900) 15,187.

Union, or TOKELAU, a group of islands in the Pacific, belonging to Great Britain, between 8° and 12° S., and 165° and 173° W. They include Fakaofu, or Bowditch, Nukunono, or Duke of Clarence, and Oatafu, or Duke of York, Nassau, and Danger. Total area, 7 sq. m. Pop. 1,050.

Union and Repeal. The Irish Parliament would have consented to a union with Great Britain in 1707, but it showed itself angrily hostile to such a measure in 1759. A union between Great Britain and Ireland was advocated by many thinkers, from Sir William Petty to Adam Smith. But the occasion did not arise until the rebellion of 1798 had broken up society in Ireland, and had terrified and weakened the Irish Parliament. The first attempt to bring about a union failed in 1799. The project of a union was brought forward by Castlereagh and by Lord Clare in the two Irish houses, in the session of 1800. It was resisted with great force of eloquence by

Grattan, Foster, and Plunket; but the measure became law in July of that year. The Irish was then merged in the British Parliament; but Ireland was to remain, for most purposes, a separate state, with a separate government, separate courts of justice, and a separate exchequer. Ireland was to be represented in the Imperial House of Lords by twenty-eight lay peers and four prelates, and in the Imperial House of Commons by sixty-four county and thirty-six borough members. Ireland was to contribute about 12 per cent. of the total revenue to the support of the empire, England and Scotland contributing about 88 per cent., and Ireland was to continue to be fiscally a distinct country. The trade between Great Britain and Ireland was made more free than it had been; but protection was, to some extent, afforded to the young manufactures of the lesser island. The capital defect of the union was that it was only a 'Protestant union'; it did not extend to the Irish Catholics—more than three-fourths of the Irish community. George III. angrily refused to sanction Catholic emancipation on any terms. The emancipation of the Irish Catholics was not indeed effected till 1829, and the commutation of the tithes of the church was not accomplished until 1838.

The representation of Ireland in the House of Commons was increased by five members in 1832. The Irish Church was disestablished and disendowed in 1869. The financial arrangements made in 1800 have been repeatedly changed. In 1816 Ireland's separate exchequer was abolished, her debt was added to the National Debt, and gradually she has become 'assimilated in finance' with Great Britain. A commission has lately reported that she is greatly overtaxed. O'Connell always denounced the union, and brought the question of repeal before the House of Commons in 1834; but he obtained the vote of only one English member. When Peel came into office in 1841 the Irish tribune again raised the cry, and a movement against the union was conducted under his guidance in 1843. Enormous 'monster' meetings were assembled to clamour for repeal. O'Connell had the assistance of a small body of able men, known as 'Young Ireland'; but the movement was one wholly of the Catholic Irish. It collapsed when O'Connell was tried and convicted. In 1870-1 Isaac Butt endeavoured to effect a change in the union under the form of Home Rule. Parnell, on the death of Butt, eagerly took up the ques-

tion. In 1835 Mr. Gladstone became a convert to Home Rule. See GLADSTONE and HOME RULE.

Union Assessment Acts. See RATING.

Union - Castle Steamship Line. In 1853 the Union Steam Collier Company was formed, being renamed the Union Steamship Company in 1856. It comprised a service to the Cape of Good Hope, Natal, and E. Africa. The Castle Mail Packets Company was formed in 1881, to take over the business of Messrs. Donald Currie and Co., and for many years carried the mails to S. Africa. On Jan. 1, 1900, the two companies amalgamated under the title of the Union-Castle Mail Steamship Company, with a capital of £2,000,000. The fleet consists of thirty-eight steamers, including the *Kenilworth Castle* (12,975 tons) and the *Armada Castle* (12,973 tons), aggregating 263,531 tons, and is now almost entirely engaged in carrying mails, passengers, and cargo to S. Africa, the fast mail steamers being dispatched from Southampton every Saturday.

Unionidae, or FRESHWATER MUSSELS, a family of bivalves, containing a great number of species, which are most numerous in N. America. Four species are British. Of these *Unio margaritifera*, the pearl mussel, is abundant in mountain streams, and until the end of the 18th century was the object of an important fishery. The swan-mussel (*Anodonta cygnea*) is also abundant in many streams and rivers.

Unionist. See POLITICAL PARTIES.

Union Jack. See FLAG.

Union Pacific Railroad was the first railway built across N. America. Starting from the Missouri at Omaha (1,400 m. W. of New York), it met the Central Pacific Railroad building eastwards from San Francisco. The present railway controls 5,929 m., the main tracks running from Council Bluffs, Iowa, to Utah, from Kansas to Denver, and from Denver to Cheyenne, Colorado. The gross earnings (1903-4) were £11,055,850, and the net earnings £5,250,540. Four per cent. dividends were paid on the common and preferred stocks.

Union Steam Ship Co. of New Zealand emanated from a small business carried on between Otago and other ports of New Zealand. In 1875 the present company was formed, and it maintains services between Australasia and the Pacific, Canada, and India. The fleet consists of 55 steamers, of an aggregate tonnage of 112,540, the largest vessel being the *Aparima* (5,700 tons). Capital, £600,000.

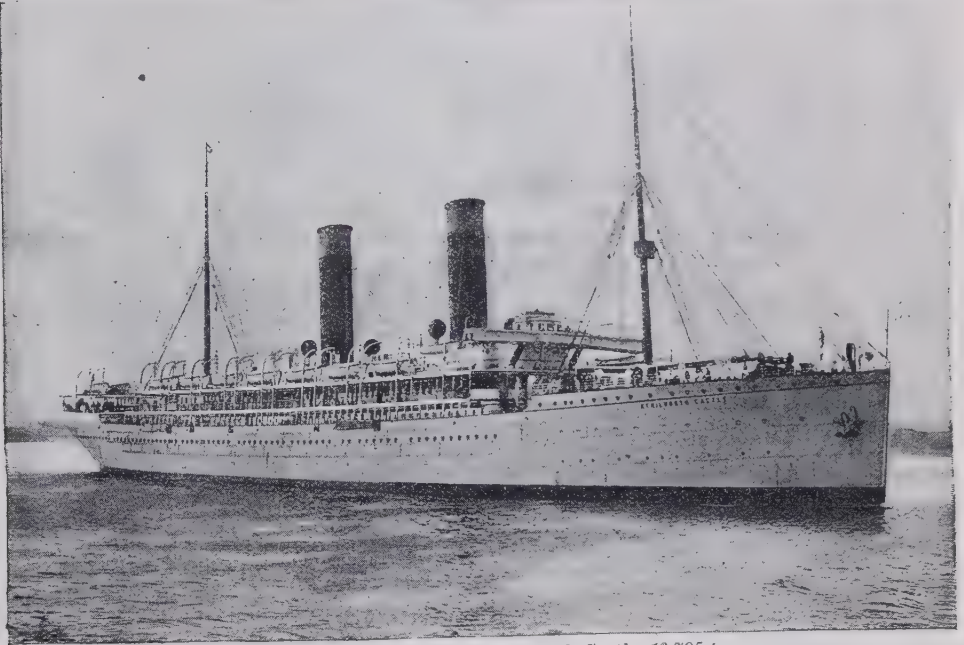
Unit. See UNITS.

Unitarianism is the name given to the tenets of those who maintain, in opposition to the orthodox doctrine of the Trinity, the undivided unity of the divine nature. As the distinguishing doctrine of the Old Testament, the Unitarian doctrine held its ground for a considerable time in the early church, but gradually disappeared before the rise of the orthodox theology, and under the pressure of ecclesiastical authority. No sooner had the light of the renaissance dawned upon the world than doubts about this most mysterious of the church's dogmas began to arise; and notwithstanding the awful warning

of James I. the Socinian heresy made considerable progress, and in 1612 Bartholomew Legate (the last of the Smithfield martyrs) was burned at the stake for maintaining that Christ was a 'mere man.' The last decade of the 17th century was marked by the publication of the Unitarian tracts, of which Thomas Firmin was the chief promoter. In the next century the most distinguished name is that of Joseph Priestley (1733-1804); but Priestley did not himself contemplate or desire the formation of a Unitarian church. A strong impulse towards this end was, however, given by the resignation

put forward any authoritative confession of faith. One of their most distinctive principles, indeed, is the right of private judgment in entire independence of theological tests.

At this point, however, the attempt may be made to state briefly what are the views generally accepted among them. Unitarianism was originally based upon Scripture, which was held, when rightly interpreted, to testify everywhere to the sole Godhead of the Father, Christ being either an emanation from the Supreme, the first created Being superior to the angels (Arianism), or a 'mere man' (the humanitarian



Union-Castle Liner R.M.S. Kenilworth Castle, 12,795 tons.

conveyed by the fate of Servetus (burned at Geneva, Oct. 27, 1553), the Unitarian doctrine, through the labours of the two Socini and other leaders, obtained a wide diffusion in Europe, especially in Italy, Poland, and Transylvania. In the last-named country it took permanent root. The Transylvanian Unitarians are a fairly numerous sect, with upwards of one hundred congregations, organized under a bishop. In England Unitarianism was not legalized till 1813, but as early as 1548 one John Assheton, a priest, was charged before Cranmer with denying the deity and atonement of Christ, and saved his life only by retracting. In the reign

in 1773 of his living of Catterick by Theophilus Lindsey, and the opening in the following year of the first Unitarian chapel in Essex Street, London. Modern Unitarians claim to be the spiritual descendants of the Presbyterians who in 1662 were driven out of the Church of England by the Act of Uniformity, and the trust deeds of whose meeting-houses generally prescribed no specific doctrines. The repeal of the penal law in 1813 favoured the more open promulgation of Unitarian opinions, and in 1825 the British and Foreign Unitarian Association was founded. But the Unitarian societies of Great Britain and America have never

view), but made both Lord and Christ by His resurrection from the dead. At no time, however, have Unitarians believed in a verbal infallibility. The Bible is, in their view, at most the record of a revelation. The older school of Unitarians of the earlier half of the 19th century held that the gospels, as credible histories, proved beyond reasonable doubt the divine mission of Jesus Christ, and for many years the whole question of the supernatural continued to be the subject of keen controversy. The more conservative view was represented by Channing, with a tendency, however, to throw the main stress on

the self-evidencing nature of Christ's message and character rather than on the physical miracles. Theodore Parker of Boston, U.S., gave up the supernatural altogether; and James Martineau, long the leader of the English Unitarians, having controverted Parker in his earlier days, arrived at last at the same conclusion. Meantime the Unitarians had long given up, if indeed they ever held in any orthodox sense, the doctrines of the fall, the atonement, and eternal punishment. The general tendency at present seems to be towards a simple theism, with Jesus Christ as its chief prophet. In England the Unitarians are strongest in Lancashire, and in Boston, U.S., they were for many years the leading sect. In the north of Ireland many of the old Presbyterian foundations have become Unitarian. The Unitarians maintain Manchester College, Oxford, and the Unitarian Home Missionary College, Manchester. See Wallace's *Anti-trinitarian Biography* (1850); Tayler's *Religious Life of England* (ed. 1876); Gordon's *Heads of English Unitarian History* (1895); Bonet-Maury's *Early Sources of English Unitarian Christianity* (1884); and the *Works of Channing and Martineau*.

United Free Church of Scotland was formed in 1900 by the union of the Free Church of Scotland and the United Presbyterian Church. The Free Church of Scotland began its separate existence, apart from the state, on May 18, 1843. After the Disruption (see **FREE CHURCH OF SCOTLAND** and **SCOTLAND, CHURCH OF**) the Free Church of Scotland set itself to provide churches in every parish, supported only by the liberality of its people. To make this possible the Sustentation Fund was organized—a central fund to which the various congregations contributed locally, and which was distributed equally among all the ministers of the church. In addition to this the claims of the foreign field were felt by the church from the first.

The United Presbyterian Church began its career under this name in 1847, in a union of the Secession and Relief Churches. See **SCOTLAND, CHURCH OF**.

It was the Relief Church which began the movement towards union with the Secession, soon after the union of 1820; but it was not till May 13, 1847, in the historic Tanfield Hall, Edinburgh, that the two churches became one under the name of the United Presbyterian Church (U.P.). At the union the Relief numbered 113 congregations, and the Secession 384. The United Presbyterian Church was espe-

cially distinguished for its interest in foreign mission work, and its general liberality.

The Free Church minority remained apart from the union of 1900, and not only claimed to be the true successors of the Disruption fathers, but raised an action claiming the whole funds and property of the Free Church. The Scottish courts decided in favour of the United Free Church, but on appeal being made to the House of Lords the decision was reversed on Aug. 1, 1904, by a majority of five to two. The pecuniary resources of the church being cut off at a blow, it was at once determined by the United Free Church to raise an emerg-

executive commission was appointed to allocate between the Free Church and the United Free Church the property in question. **United Greeks.** See **GREEK CHURCH**.

United Irishmen. Theobald Wolfe Tone (1763-98), a young lawyer, founded the United Irish Society in the autumn of 1791; this at first was wholly composed of Presbyterians. Tone's purpose was to unite Presbyterian and Catholic Ireland in an armed league against England. He was made secretary of the Catholic Committee which in 1792-3 was pressing the claims of Catholic Ireland to obtain the abolition of the remaining penal laws.



United Provinces, India.

ency fund, so as to carry on the work at home and abroad, and within the year over £150,000 had been raised. Meanwhile the Free Church enforced the judgment, and the United Free Church professors were evicted from the New College, and several ministers, chiefly in the Highlands, from their churches. Feeling ran high throughout the country, and the government appointed a royal commission to inquire and report. Their report was issued in April 1905: the commissioners found that the Free Church was unable to execute the trust of all it had claimed. By the Churches (Scotland) Bill, which received the royal assent on Aug. 11, 1905, an

Tone went to Paris in 1796, and persuaded the Directory to fit out an expedition, which failed at Bantry, mainly owing to the weakness of Grouchy. Meanwhile the United Irish leaders had got parts of the north ready for an armed rising, which broke out in 1797, followed by the bloody rebellion of 1798, which was marked by atrocities in Wexford and Wicklow. The United Irish directors were nearly all made prisoners, but they were allowed to leave Ireland. Tone was captured, in a French man-of-war, and committed suicide.

United Kingdom of Great Britain and Ireland. See **GREAT BRITAIN, ENGLAND AND WALES, SCOTLAND, IRELAND**, etc.

United Provinces, in N. India, include the provinces of Agra and Oudh, which formed the greater part of the lieutenant-governorship of the old North-Western Provinces, and are bounded on the N. by the Himalayas and Nepal, and on the W. by Rajputana and the Punjab. They cover an area of 107,164 sq. m., while 6,110 sq. m. are under native rule. The Jumna and the Ganges skirt the W. and S., and unite at Allahabad, the capital. Stone is quarried at Mirzapur. Though the soil is less fertile than that of Bengal, these provinces constitute the largest wheat-growing district of India, and their fertility is enhanced by magnificent irrigation canals. Other agricultural products are oil-seeds, sugar, rice, indigo, tobacco, and cotton. The provinces are administered by a lieutenant-governor. There are three feudatory chiefs—Rampur, Benares, and Tehri. The country is densely populated. Nearly 88 per cent. of the inhabitants are Hindus; professed Mohammedans number over 10 per cent. In 1763 an unsuccessful invasion of Bengal by the nawab wazir of Oudh led to the cession to the East India Company of the southern districts. This territory was sold to the king of Oudh, whose indebtedness caused its reversion, along with Oudh, to the British. The remaining districts came into the possession of the crown as the fruits of victory over Scindia in 1803 and the Ghurka war of 1814-15. It was in these provinces that the mutiny broke out in 1857. Pop. (1901) 47,691,780.

United Service Institution, THE ROYAL, was formed in 1831 for the promotion of military and naval science, art, and literature. To it is attached a museum containing a celebrated ceiling by Rubens, models of war-vessels, ordnance, small arms, and many military and naval relics and trophies.

United States, a republic of N. America. It occupies the middle portion of the continent, from the Atlantic to the Pacific, and from 24° 30' to 49° N. lat.; also the 'territory' of Alaska, and the 'territory' of Hawaii; and exercises jurisdiction over Porto Rico in the W. Indies, the Philippines and other small islands, including Guam and Tutuila in the Pacific. The total area is as follows:—

	Sq. Miles.
United States . . .	3,026,500
Alaska	590,884
Hawaii	6,449
Porto Rico	3,600
Philippines and smaller islands . .	120,000
Total	3,747,433

The country is divided into 45 states, a federal district comprising the capital (Washington), and six territories, besides dependencies. The following table shows the area of each state and territory and the federal district of Columbia, with the year of

bordered by sandbars, behind which are lagoons and marshes. This marshy strip becomes broadest in S. Virginia and N. Carolina, where are the Great Dismal Swamp and the 'pocosins.' In all this part of the coast the rivers broaden into estuaries

	Area. Sq. m.	Org. as Ter.	Admit. as State.
1. Alabama (Ala.)	52,250	1817	1819
2. Alaska Territory	590,884	1867	...
3. Arizona Territory (Ari.) . . .	113,020	1863	...
4. Arkansas (Ark.)	53,850	1819	1836
5. California (Cal.)	158,360	...	1850
6. Colorado (Col.)	103,925	1861	1876
7. Connecticut (Conn.)	4,990	Original	state
8. Delaware (Del.)	2,050	Original	state
9. District of Columbia (D.C.) .	70	1791	...
10. Florida (Fla.)	58,680	1822	1845
11. Georgia (Ga.)	59,475	Original	state
12. Hawaii Territory	6,449	1900	...
13. Idaho (Id.)	84,800	1863	1890
14. Illinois (Ill.)	56,650	1809	1818
15. Indiana (Ind.)	36,350	1800	1816
16. Indian Territory	31,400	1834	...
17. Iowa (Ia.)	56,025	1838	1845
18. Kansas (Kan.)	82,080	1854	1861
19. Kentucky (Ky.)	40,400	...	1792
20. Louisiana (La.)	48,720	1805	1812
21. Maine (Me.)	33,040	...	1820
22. Maryland (Md.)	12,210	Original	state
23. Massachusetts (Mass.)	8,315	Original	state
24. Michigan (Mich.)	58,915	1805	1837
25. Minnesota (Minn.)	83,365	1849	1858
26. Mississippi (Miss.)	46,810	1798	1817
27. Missouri (Mo.)	69,415	1812	1821
28. Montana (Mon.)	146,080	1864	1889
29. Nebraska (Neb.)	77,510	1854	1867
30. Nevada (Nev.)	110,700	1861	1864
31. New Hampshire (N.H.)	9,305	Original	state
32. New Jersey (N.J.)	7,815	Original	state
33. New Mexico Territory (N.M.) .	122,580	1850	...
34. New York (N.Y.)	49,220	Original	state
35. North Carolina (N.C.)	52,250	Original	state
36. North Dakota (N. Dak.) . . .	70,795	1861	1889
37. Ohio (O.)	41,030	...	1802
38. Oklahoma Territory	39,030	1890	...
39. Oregon (Or.)	96,030	1848	1859
40. Pennsylvania (Pa.)	45,215	Original	state
41. Rhode Island (R.I.)	1,250	Original	state
42. South Carolina (S.C.)	30,570	Original	state
43. South Dakota (S. Dak.) . . .	77,650	1861	1889
44. Tennessee (Tenn.)	42,050	...	1796
45. Texas (Tex.)	265,780	...	1845
46. Utah (Ut.)	84,970	1850	1896
47. Vermont (Vt.)	9,565	...	1791
48. Virginia (Va.)	42,450	Original	state
49. Washington (Wash.)	69,180	1853	1889
50. West Virginia (W. Va.) . . .	24,780	...	1863
51. Wisconsin (Wis.)	56,040	1836	1848
52. Wyoming (Wy.)	97,890	1868	1890

organization as a territory and of admission as a state to the Union.
Coasts.—The Atlantic coast in Maine, New Hampshire, and N. Massachusetts is rocky, and fringed with thousands of rocky islets. From Boston Bay southward its character changes to that of low, sandy coast, in many places

in their lower courses, owing to a recent sinking of the land. The coast of the Gulf of Mexico presents a similar character. The entire coast from Maine to Texas abounds in excellent harbours. The Pacific coast, on the other hand, presents an almost unbroken front to the sea. There are few good harbours except San

Diego harbour, San Francisco Bay, and Puget Sound.

Topography.—There are two mountain systems, respectively in the E. and W., between which is a broad depression. The eastern of these mountain systems, known as the Appalachian Range, stretches from Maine in the northeast south-westward to Alabama. From New Jersey southwards it consists of, on the east, a succession of narrow ridges, closely parallel to one another, and, on the west, of a plateau, inclined gently to the westward, and greatly cut or dissected by the gorges of streams. This plateau is known in the N. as the

area is drained southward to the Gulf of Mexico by the Mississippi. This great valley, when viewed in a broad way, has a comparatively level floor. Many of its rivers flow between bluffs from one to four hundred feet in height. The most pronounced relief feature in the valley consists of the Ozark Hills, in S.W. Missouri, N.W. Arkansas, and Indian Territory. West of the Missouri, for 500 m. or more, the land, consisting of treeless prairies or plains, rises steadily to the base of the western mountains, from 500 to 1,000 ft. up to 6,000 or 8,000 ft. These plains stretch from Canada to Mexico, a dist-

of the Pacific. The Rocky Mts. enter the United States from Canada and broaden rapidly, until, in Wyoming, they break off suddenly, leaving a broad gap, occupied by elevated plateaus from 7,000 to 8,000 ft. in height. On the southern edge of Wyoming the mountains rise again, and traverse Colorado and New Mexico in a succession of high ranges, 14,000 ft. and more in height, among which are the high mountain valleys known as North, Middle, and South Parks, and San Luis Valley. The Plateau Region occupies the western part of Colorado and New Mexico, E. Utah, and most of Arizona. In



United States—Contours.

Barraband Edg.

Alleghany, and in the s. as the Cumberland plateau. In western N. Carolina the eastern section develops into a broad plateau, on which stand many mountain ranges, with altitudes exceeding 6,000 ft. and culminating in Mt. Mitchell, 6,700 ft. In New England the hill country extends nearly or quite down to the coast, but from New Jersey a broad gently-sloping plain separates the mountains from the sea, and grows broader southward.

The Appalachian mountain system is succeeded on the westward by a broad depression, occupying one-half the area of the country. By far the greater part of this

ance, as the crow flies, of 1,500 m. In the western part of S. Dakota, the Black Hills rise like an island to altitudes exceeding 7,000 ft.

The ranges of the western mountain system rise from a great plateau, whose altitude is, on an average, about 6,000 ft. high, with a maximum of 10,000 ft. The highest summits reach between 14,000 and 15,000 ft. above the sea. Most of these ranges trend nearly N. and S., varying in some places towards the N.W. and S.E.

This mountain region may be grouped into the Rocky Mts., the Plateau Region, the Great Basin, the Cascade Range, the Sierra Nevada, and the Coast Ranges

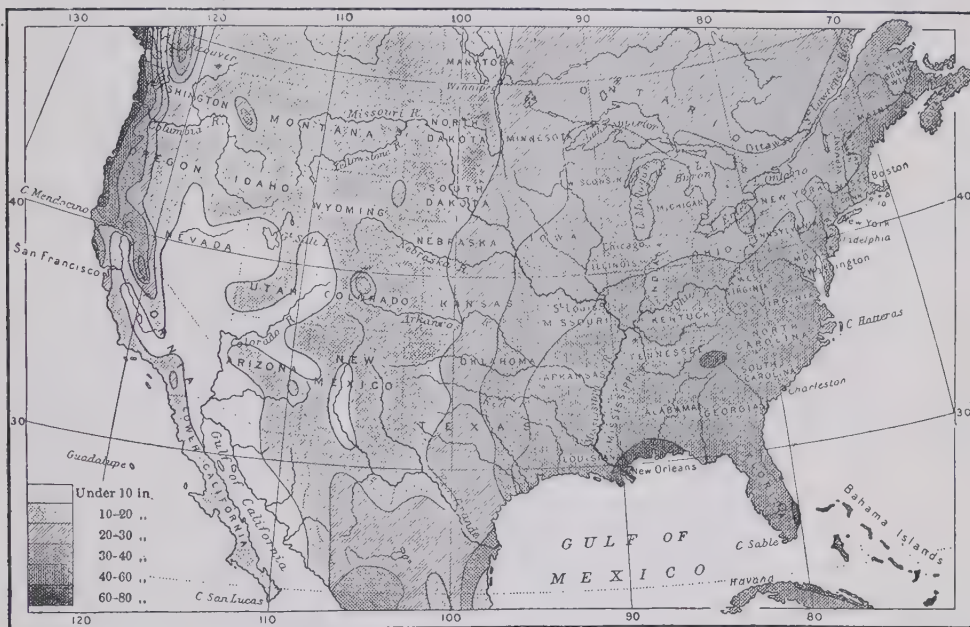
this region every stream flows in a precipitous, rock-walled cañon, the most notable being the Colorado, with the Grand Cañon, in N. Arizona, 100 m. long, and 6,000 ft. in depth. Still farther w., separated from the Plateau Region by the Wasatch Range, is the Great Basin, a land-locked desert region, whose scanty waters find escape only by evaporation. In this basin lies the Great Salt Lake of Utah. There are two localities in this region which are below sea-level, one in E. California, known as Death Valley, the other in the southern part of the same state, known variously as Soda Lake Desert and Colorado Desert. Parallel with the Pacific coast

is a range which stretches almost continuously from the Canadian boundary to S. California; in Washington and Oregon it is known as the Cascade Range, and from it rise many extinct volcanoes. Among these volcanic peaks are Mt. Rainier in Washington, 14,440 ft. high; and Shasta, in N. California, nearly the same height. In California this range is known as the Sierra Nevada. It rises abruptly from the Great Basin on the E., and descends westward in great spurs, deeply furrowed by stream cañons. Near its southern end it culminates in Mt. Whitney, little short of 15,000 ft. West of this range is a valley, stretching from the

drain the Rocky Mts. from Canada to Texas. The navigable length of the Mississippi and its branches, measured in straight lines, is not less than 9,200 m. The northern portion of the Great Valley is drained to the Great Lakes and the St. Lawrence R., which, with canals and locks at Sault Ste. Marie and Niagara, afford an unbroken waterway from Duluth, at the head of Lake Superior, to the Atlantic. The great western rivers flowing to the Pacific—the Colorado, Sacramento, and Columbia—are navigable, the Colorado for 400 m., the Sacramento and its branch the San Joaquin for 250 m., and the Columbia and its branches for 725 m.

30 to 40 in., and on the Cordilleran plateau from 0 to 20 in.; it is least in Nevada, S.W. Arizona, and S.E. California. On the Pacific coast it ranges from 10 in. in the south to 90 in. or more in W. Washington.

Forests.—The entire eastern half of the country was originally covered with dense forests, but a great proportion of the large trees have been cut for lumber. Going westward, the forests gradually diminish with the rainfall. In the Cordilleran region, forests are commonly found on the mountains, while the valleys and plateaus are treeless. In W. Washington, Oregon, and N.W. California, the forests



United States—Annual Rainfall.

Bartholomew Edit.

northern boundary of the country to S. California, and also closely parallel with the coast; while separating it from the Pacific is a system of coast-ranges, from 4,000 to 8,000 ft., the latter height being reached in the Olympic group in N.W. Washington.

Rivers.—The streams flowing to the Atlantic rise in the Appalachian Mts., and have comparatively short courses. The Mississippi drains the whole valley from the Appalachians to the Rocky Mts. Its main eastern branch is the Ohio, whose sources drain the western slopes of the Appalachian range. Its western branches are the Missouri, Arkansas, and Red rivers, which

Climate.—The temperature is that of the north temperate zone, the mean annual temperature ranging from 75° F. in the extreme S. to 40° or less along the northern border. The range of temperature between summer and winter is great in the interior, reaching a maximum on the Cordilleran plateau and a minimum on the Pacific coast, where the extremes are tempered by the prevalent west wind from the ocean. The annual rainfall in the eastern part of the country is greatest on the coast of the Gulf of Mexico, where it commonly exceeds 60 in., and diminishes northward and westward. On the Great Lakes it ranges from

are extremely dense, and the trees reach a great height and girth.

Agriculture.—Of the total farm area, 414,498,487 ac., or 21 1/6 of the area of the country, were under cultivation in 1900. The average size of farm was 147 ac., of which 73 ac. were improved. Of the total number of farms, 65 per cent. were owned by their occupants, and 35 per cent. were rented. The principal crops are Indian corn, wheat, rye, oats, barley, buckwheat, cotton, tobacco, wool, hay, and potatoes. Of these, Indian corn is produced in nearly every state, but most abundantly in the more northern states of the Mississippi valley. Wheat is produced in all the north-

ern and western states. Oats is produced all over the N. and W. Cotton is confined to the southern states, and mainly to those bordering on the Atlantic and the Gulf of Mexico. Tobacco is cultivated in nearly all the states, but most of the product comes from Kentucky, Tennessee, N. Carolina, and Virginia.

Mineral Production.—The United States produces nearly every mineral known to the arts. The total value of the mineral products in 1904 was £257,729,117. The quantity of each of the principal products was as follows:—Pig iron (long tons), 16,497,033; silver (troy ounces), 55,999,864; gold (troy ounces), 3,910,729;

Virginia, Tennessee, Ohio, Colorado, and Wyoming. Gold and silver are found in all the Rocky Mountain and Pacific coast states. Copper is mined in N. Michigan, Montana, and Arizona. Lead and zinc are found in S.W. Missouri and S.E. Kansas, and lead in most of the western states, in connection with silver ores. Quicksilver is mined only in the Coast Ranges of California. Bituminous coal is very widely distributed, and only the best and most accessible is being mined. The product comes from Pennsylvania, W. Virginia, Ohio, Indiana, Iowa, Kansas, Wyoming, Alabama, and Kentucky. Anthracite coal is found only in N.E.

Massachusetts, Ohio, and New Jersey. The principal articles of manufacture are agricultural implements, boots and shoes, carriages and wagons, cars (railway and street), cotton goods, flour and grist mill products, furniture, iron and steel, leather, liquors (malt and distilled), lumber, paper and wood pulp, petroleum, books, silk goods, slaughtering and meat packing, woollen and worsted goods. The manufacture of agricultural implements, furniture, and wagons is carried on chiefly in the cities about the Great Lakes. The great centre of the boot and shoe industry is in E. Massachusetts. Clothing is made in all the large cities, especially in



United States—January Isotherms.

Marshalltown Edit

copper (pounds), 812,537,267; lead (short tons), 307,000; zinc (short tons) 186,702; quicksilver (flasks), 34,570; aluminium (pounds), 8,600,000; coal, bituminous (short tons), 279,153,718; coal, anthracite (long tons), 65,318,400; petroleum (barrels), 117,063,421; natural gas (value), £7,699,352; phosphate rock (long tons), 1,874,428; salt (barrels), 22,030,002; borax (short tons), 45,647. The principal source of iron ore is near the south shore of Lake Superior, in N. Michigan, Wisconsin, and Minnesota. In N. Alabama, iron ore is in vast quantities, coal for smelting, and limestone for flux, are found in close juxtaposition. Iron is mined also in New York, Pennsylvania,

Pennsylvania. Petroleum is obtained mainly in Pennsylvania, New York, Ohio, Indiana, Texas, and California, and natural gas follows it closely.

Manufactures.—Until recent years nearly all the manufactured products were used in the country; but the United States is now a formidable competitor of the United Kingdom and Germany in the markets of the world. The principal manufacturing region consists of S. New England, New York, New Jersey, Pennsylvania, Ohio, Indiana, and Illinois. The principal manufacturing states in the order of their importance are:—New York, Pennsylvania, Illinois, Massa-

New York and Philadelphia. Cotton goods are manufactured chiefly in Massachusetts and Rhode I., although the cities of the southern states are rapidly coming to the front. While flour mills are found almost everywhere, Minneapolis (Minnesota) is of first importance as a flour-milling centre. In the manufacture of iron and steel the cities of Pennsylvania are easily first, followed by those of Ohio, Illinois, and Alabama. In printing and publishing New York city takes the lead. The business of slaughtering and meat-packing is centred in Chicago, Illinois, S. Omaha, Nebraska, and Kansas City (Kansas). The manufacture



of woollen goods is carried on mainly in E. Massachusetts and Rhode I., and in Philadelphia.

Transportation.—The railway system is nearly equal in mileage to that of the rest of the earth. In 1904 there were in operation 212,349 miles of railway. The total navigable mileage of rivers is estimated at 14,100 m.; there are 2,700 m. of canals in operation. The vessels employed in traffic upon the coast, the Great Lakes, the canals and rivers, had in 1905 a total tonnage of 5,441,688 tons. This, with 943,750 tons engaged in foreign trade, and 71,105 tons engaged in the fisheries, gives a total of 6,456,543 tons.

Foreign Commerce.—The total amount of imports and exports in 1905 was £538,198,515, of which

shows the value of the principal articles of export in 1904-5.

The domestic production of wool forms about two-thirds of the

TABLE I.

	Imports.	Exports.	Total.
United Kingdom . . .	£35,162,383	£104,679,370	£139,841,753
Germany	23,653,771	38,844,094	62,497,865
France	17,966,089	15,267,494	33,233,583
Netherlands	4,343,749	14,659,672	19,003,421
Belgium	5,176,491	7,695,758	12,872,249
Italy	7,725,715	7,748,134	15,473,849
British N. America . .	12,730,772	28,595,801	41,326,573
Mexico	9,294,175	9,151,623	18,445,798
Brazil	19,968,618	2,197,020	22,165,638
British E. Indies . . .	10,738,042	1,509,587	12,247,629
Japan	10,364,352	10,343,936	20,708,261
Australasia	2,378,585	5,270,662	7,649,244
British Africa	319,672	2,935,680	3,255,352

The exports of cotton are shipped mainly from southern ports—New Orleans, Savannah,

consumption, the remaining one-third being imported.

The foreign commerce of the



United States—July Isotherms.

£228,158,830 were imports, and £310,039,685 exports. The total volume of trade was little more than one-half that of the United Kingdom in the same year, but the exports were nearly equal. As compared with Germany, the total volume of trade was slightly less, but the exports were larger. Europe supplies 50 per cent. of imports, and takes 73 per cent. of exports; N. America, 20 per cent. of imports, and 16 per cent. of exports; S. America, 12 per cent. of imports, and 3 per cent. of exports; Asia, 15 per cent. of imports, and 4 per cent. of exports. (See Table I.) Table II.

Galveston, and Wilmington. Wheat and wheat flour are shipped mainly from New York, Boston, Baltimore, New Orleans, Galveston, San Francisco, and Portland (Oregon). The principal shipping ports for tobacco are New York, Baltimore, and New Orleans. Of the Indian corn crop, 10 per cent. is exported, and 45 per cent. of the products of petroleum. The principal articles of import in 1904-5, with their values, were:—Wool, £3,578,732; sugar and molasses, £19,529,089; coffee, £16,930,812; tea, £3,246,171; precious stones, £6,752,301; chemicals, £12,958,847.

country is carried mainly in foreign vessels. Of the total tonnage entered and cleared in United States ports in 1905, only 23 per cent was under the United States flag.

Postal Service.—The postal service is entirely in the hands of the federal government, and is carried on usually at a loss, the deficit ranging from one to two millions sterling. The telegraph system is controlled almost entirely by one company (the Western Union Telegraph), and the telephone is also practically in the hands of one company (the American Bell Telephone).

Public Lands.—The United States originally owned nearly all the area of the states, with

those which affect the states collectively, including all foreign relations. At the head of the

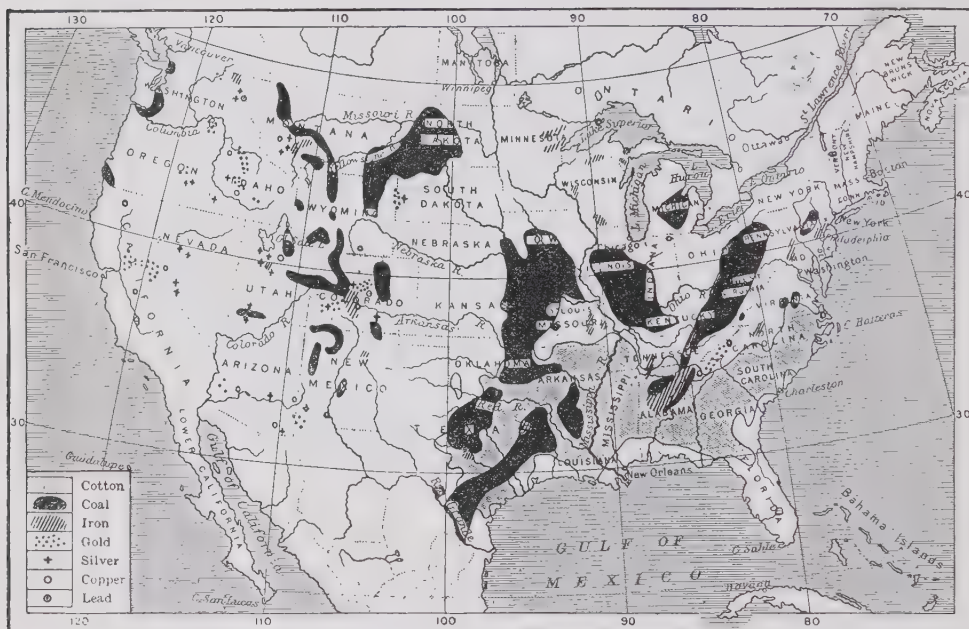
TABLE II.

Agricultural implements	£4,144,348
Animals	9,345,656
Breadstuffs	21,546,582
Coal	5,831,664
Copper	17,512,800
Cotton (raw)	75,993,000
Cotton (manufactured)	9,933,216
Iron and steel, and manufactures of	26,945,672
Leather, and manufactures of	7,587,349
Meat and dairy products	33,999,774
Mineral oils	15,958,644
Oil cake and oil cake meal	4,355,322
Tobacco	7,098,200
Wood, and manufactures of	11,600,595

the exception of the original thirteen. Homesteads have been given, or sold at a nominal price,

federal executive is the president, elected every four years. His cabinet is composed of nine

which body the vice-president of the United States is the president, consists of ninety members—two from each state. They are elected by the state legislatures for six years, in such wise that one-third of their number retire every two years. The House of Representatives consists of 386 members, being on a basis of 193,284 inhabitants to each member. The members are elected directly by the people. In addition to these members, each territory sends a delegate, who may take part in the discussions of the house, but has no vote. The judicial department is composed of a Supreme Court, consisting of a chief justice and eight associate justices, who try cases on appeal from the lower United States courts and from the state



United States—Chief Products.

to all *bona-fide* settlers. Vast areas have been given to railway companies and in aid of education. The country's Indian wards have been provided with ample reservations. The government has established three great national parks, and it has reserved more than 72,000 sq. m. of forest land.

Government.—The government is republican in form, with the principle of self-government, or home rule, as its basis. To the state are delegated those matters which concern the state alone, and to the federal government

ministers, known as the secretaries of state, war, navy, treasury, interior, agriculture, and commerce and labour, the post-master-general, and the attorney-general. These ministers act as his advisers, and also as the executive heads of the various departments. The president has no legislative power, except that of approving or disapproving the acts of Congress; and that body may, by a two-thirds vote, pass a measure over his veto. The Congress consists of two houses, the Senate and the House of Representatives. The Senate, of

courts. There are also circuit and district courts for trying cases of violation of the United States laws. The state governments are patterned closely after the federal government, the executive being known as the governor. There are in each state two houses of legislature and a state judiciary. All officers are elected by the people, except the judiciary of certain states, who are appointed by the governor.

Finances.—The outstanding principal of the public debt was, in 1905, £197,973,354. The debt *per capita* of the popula-

tion was £2, 12s. The receipts of the government are derived mainly from customs and excise duties. These, with receipts from the postal service and miscellaneous sources, made in 1905 the total income of the government £139,420,254. The total expenditure was £144,021,099. The principal items of expenditure were as

and the Philippine Is. The population was distributed very unevenly over the country, as is shown by Table III., which gives the population of each state, its decennial rate of increase, the density of population, and the proportion of urban to the total. The largest city in the country, and, after London, the largest in

bering 8,840,388, formed 11·6 per cent. of the entire population; nearly nine-tenths of them were found in the states s. of Pennsylvania and the Ohio, and a large majority in those states bordering upon the S. Atlantic and the Gulf of Mexico. Persons of foreign birth formed 13·7 per cent. of the population, and were found mainly in the states N. of Maryland and the Ohio and in the west.

Prior to 1847, immigration was not of great magnitude; but in the fifty-four years after that not less than eighteen and a half millions of people migrated from Europe to the United States. Persons unable to read and write in 1900 were 10·7 per cent. (as against 17 per cent. in 1880) of that part of the population ten years of age or more. The percentage of illiteracy was—native whites, 4·6; foreign-born, 12·9; negroes, 44·5. Of the wage-earners, 35 per cent. were engaged in agriculture, fisheries, and mining, 4·3 per cent. in the professions, 19·2 per cent. in domestic or other personal service, 16·4 per cent. in trade and transportation, and 24·4 per cent. in manufacturing industries. In all parts of the country public schools are maintained, mainly at the expense of the local governments.

Indians.—The Indian population in 1900 numbered 237,224. They were scattered widely over the country, but the great majority were w. of the Mississippi. In recent years a policy of allotting lands to them in severalty has been instituted. On the whole, these people are making slow progress in civilization.

Defence.—A standing army limited to 100,000 of all ranks is allowed by the federal laws to be maintained. This army is divided into 30 regiments of infantry, 15 regiments of cavalry, an artillery corps, and 3 battalions of engineers, with a staff and the usual departmental corps. In addition to the standing army, each state maintains a local militia. These local forces have a paper strength of over 16,000,000 men. There are at the present time 2 battalions of infantry in Porto Rico and 50 companies of scouts in the Philippines extra to the establishment. The navy is almost entirely composed of modern ships, and includes over 20 first-class battleships either completed or under construction, together with a large number of armoured cruisers and smaller vessels. The *personnel* comprises about 54,000 of all ranks.

History.—The United States of America is a federation of commonwealths, which was first brought under a common consti-

TABLE III.

	Pop. (1900).	Per cent. of Gain (1880-1900).	Density of Population.	Per cent. Urban.
THE UNITED STATES.....	76,303,387	21	21	33
Alabama.....	1,828,697	21	35	7
Alaska.....	63,592	98	..	..
Arizona.....	122,931	105	1	..
Arkansas.....	1,311,564	16	25	5
California.....	1,485,053	23	9	44
Colorado.....	539,700	31	5	36
Connecticut.....	908,420	22	187	60
Delaware.....	184,735	10	94	41
District of Columbia.....	278,718	21	City	100
Florida.....	528,542	35	10	15
Georgia.....	2,216,331	21	38	11
Hawaii.....	154,001	71	24	..
Idaho.....	161,772	92	2	..
Illinois.....	4,821,550	26	86	47
Indiana.....	2,516,462	15	70	24
Indian Territory.....	392,060	118	13	..
Iowa.....	2,231,853	18	40	17
Kansas.....	1,470,495	3	18	14
Kentucky.....	2,147,174	16	54	17
Louisiana.....	1,381,625	23	30	23
Maine.....	694,466	5	23	24
Maryland.....	1,188,044	14	120	47
Massachusetts.....	2,805,346	25	349	76
Michigan.....	2,420,982	11	42	31
Minnesota.....	1,751,394	35	22	27
Mississippi.....	1,551,270	20	34	3
Missouri.....	3,106,665	16	45	32
Montana.....	243,329	82	2	27
Nebraska.....	1,066,300	1	14	16
Nevada.....	42,335	Loss	..	..
New Hampshire.....	411,588	9	46	39
New Jersey.....	1,883,669	30	250	61
New Mexico.....	195,310	27	1	..
New York.....	7,268,894	21	153	68
North Carolina.....	1,893,810	17	39	5
North Dakota.....	319,146	75	5	3
Ohio.....	4,157,545	10	102	38
Oklahoma.....	398,331	544	10	5
Oregon.....	413,536	32	5	24
Pennsylvania.....	6,302,115	20	140	45
Rhode Island.....	428,556	27	407	81
South Carolina.....	1,340,316	16	44	7
South Dakota.....	401,570	22	5	3
Tennessee.....	2,020,616	14	48	13
Texas.....	3,048,710	26	12	11
Utah.....	276,749	33	3	25
Vermont.....	343,641	3	38	11
Virginia.....	1,854,184	12	46	15
Washington.....	518,103	48	8	32
West Virginia.....	958,800	26	39	8
Wisconsin.....	2,069,042	23	33	31
Wyoming.....	92,531	52	1	24

follows:—Interest on the public debt, £4,918,188; army department, £24,435,000; navy department, £23,510,100; pensions, £28,354,800; and postal service, £30,365,300.

Population.—The population of the United States in 1900 was 76,303,387, including Alaska and Hawaii, but excluding Porto Rico

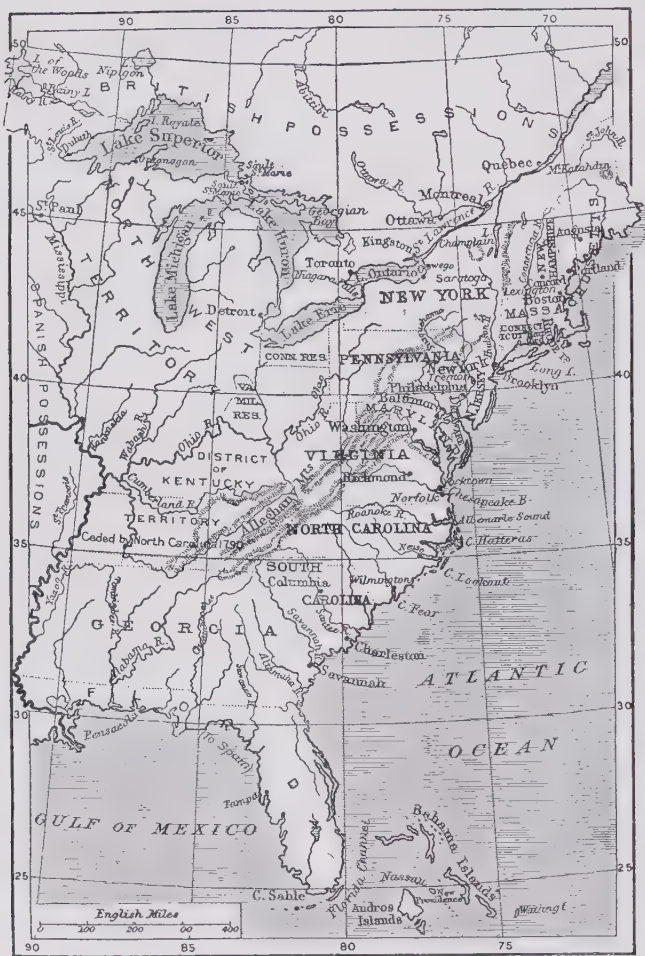
the world, is New York, with a population of 3,437,202. Two cities, Chicago and Philadelphia, have over a million inhabitants each; while three—St. Louis, Boston, and Baltimore—have each more than half a million. In 1900 males outnumbered females in the proportion of 51·2 to 48·8. Persons of negro descent, num-

tution in 1781, and adopted the present form of government in 1789. The thirteen states entering the compact at that time had been English colonies entirely independent of each other—a fact which furnishes the key to much of their later political history. New England at the north was settled by the Puritans; New York was an original Dutch col-

occurred in 1643, when certain of the New England states came together temporarily for the purpose of defence against the Indians. Again, in 1754, at a convention which met at Albany, a plan of confederation was proposed on account of the impending French and Indian war; but this was vetoed by the British Board of Trade. After the pas-

paper, painters' colours, lead, and tea for the support of the crown servants in America—and other measures—caused the colonists to take action again. The law was, in fact, rendered useless by an agreement among the colonies to give up the use of the taxed articles. At length Parliament saw that some other line must be adopted, and thought to temper the ill-feeling by removing the tax from everything except tea. This was done in 1770; but the colonists still saw in it the principle against which they were contending, and in 1773 about fifty men, disguised as Indians, boarded vessels then in harbour and threw their cargoes of tea overboard. On receipt of the full particulars of the Boston 'tea party,' the government sought to drive the colonies into submission by blockading their commerce through the Boston Port Act, and by depriving Massachusetts of certain of her charter rights. These measures drew the colonies together, and delegates were chosen from them all but one to represent them in the Continental Congress which assembled in Philadelphia in September 1774. This body prepared a 'Declaration of Rights,' stating that they were entitled to 'life, liberty, and property,' protested against the standing army in times of peace, and excluded all taxes, external or internal, for raising a revenue without their consent. Meanwhile the citizens organized their own militia, and collected stores at Concord. General Gage ordered a body of his men to destroy these munitions; but on their way thither they were met at Lexington, April 19, 1775, by a force of militia, and some fighting followed.

In May 1775 the second Continental Congress met in Philadelphia, and in June George Washington was elected commander-in-chief of the colonial forces. On July 4, 1776, the 'Declaration of Independence,' drawn up by Thomas Jefferson, was adopted. The total number of the colonists was only about three million, five hundred thousand of these being slaves. But at the outset the advantage was with the Americans. Washington pushed forward against Boston, and gained the city. But when Lord Howe arrived at New York the situation changed. Washington was defeated on Long I., and compelled to retreat towards Philadelphia. The colonies were thus cut in two, and might have been kept apart had not Washington's victories at Princeton and Trenton led Lord Howe to transfer his troops to the Chesapeake for the purpose of invading Philadelphia. This weakened the forces at New York to such an



The Original Thirteen States.

ony, governed by English laws; other middle states were under the Quakers, tempered with Lutheranism; while the southern colonies adhered to royalty and the Church of England. Some colonies were under the government of lords proprietors, some were crown colonies, while others were almost chartered democracies. The first attempt at union

sage of the Stamp Act in 1765 nine colonies met at New York and prepared a 'Declaration of Rights and Grievances,' in which they claimed the privilege of being taxed only by their own consent, and protested against the Stamp Act and other acts destructive to their trade. In 1766 the Stamp Act was repealed, but the passage of the Bill of 1767, taxing glass,

extent that they were unable to assist Burgoyne, who was stopped at Saratoga on his march from Canada, and compelled to surrender (Oct. 17, 1777). In 1778, through the efforts of Benjamin Franklin, France agreed to a treaty of alliance with the Americans. On the knowledge of this England made a last effort at reconciliation; but the terms offered were not satisfactory to the colonists. With the active assistance of France, the Americans now took the aggressive, and drove the British from Philadelphia. The latter then decided upon a southern campaign. Savannah was captured, then the whole of Georgia, and by 1780 they had gained S. Carolina. The Americans were compelled to go south, where the campaign proved on the whole disastrous. About this time Benedict Arnold was detected in a treasonable attempt to turn the strongholds of the Hudson over to the British. The forces in the north held each other in check; but General Greene met the British in the south, defeated them in 1781, and finally recovered the three lost colonies. Lord Cornwallis now sought to reach Clinton, in New York, by pushing through Virginia. He was met at Yorktown by General Washington, assisted by the French fleet and the army under Rochambeau. Completely hemmed in, Cornwallis was obliged to surrender (Oct. 19, 1781). The final treaty of peace was signed Sept. 3, 1783, and the army disbanded.

On the same day that the committee was appointed to draft the Declaration of Independence, another was appointed to prepare the Articles of Confederation. But these were not adopted by Congress until 1777, nor ratified by the states until 1781. The first confederation was a feeble instrument, owing to the lack of power in the executive. It was more or less government by committee, without force to compel the states to obey. Hence a convention was called to amend the constitution. This body met in Philadelphia in 1787, and included the most prominent men of the country—Franklin, Hamilton, Madison, Randolph, Gouverneur Morris, Robert Morris, Rutledge, King, Sherman, and Pinckney, with Washington as chairman. The result was an entirely new constitution. The leaders differed upon the general form of government—Hamilton desiring to set up a strong central administration, while Jefferson leaned toward popular sovereignty. The ratification of the constitution met with objection from several of the states, and in New York a controversy arose out of which

sprang two great factions—the Federalists upholding the constitution, and the Anti-Federalists opposing. The constitution, practically as it now stands, came into operation on the first Wednesday in March 1789. On April 30, 1789, Washington took the oath as first president in the city of New York. His secretary of state was Thomas Jefferson; attorney-general, Edmund Randolph; secretary of the treasury, Alexander Hamilton; secretary of war, Henry Knox. In 1790 the seat of government was moved to Philadelphia.

In the election of 1792 Washington was again chosen president, and in this term the animosity between Federalists and Anti-Federalists grew in intensity. The Federalists under Hamilton advocated the strengthening of the government. Their opponents, who came to be known as Republicans, largely representing the south, stood for the rights of the individual and of the state. In 1796 Washington announced that he would not be a candidate for the third term, and he thereby established a precedent which has become an unwritten law. Thomas Jefferson and John Adams became the candidates of the Republican and Federalist parties respectively. Adams was elected, and Jefferson became vice-president.

The Federalist party came into disrepute by passing the Alien and Sedition laws. The Alien Act provided for the removal from the country of any person who might be thought dangerous, and who was not entitled to the rights of the constitution; while the Sedition Act gave wide opportunity to punish persons opposed to the government, or any one who published libels against officials of the government.

In the election of 1800 Adams was defeated, and a tie between Jefferson and Burr, the Republican candidates, threw the matter into the House of Representatives for decision. Jefferson was elected. Since then the vice-president has been chosen separately by the electoral college. After this election the Federalists never again came into power. In the meantime the seat of government was removed to the new city of Washington. On coming into power the Republicans followed in many respects the example of their predecessors. In 1801 war was declared with Tripoli for the suppression of piracy, and continued until 1805. This was the first interference of Americans in foreign affairs. In 1803 a treaty with Napoleon led to the purchase of the whole of the Louisiana territory for \$15,000,000.

This included a vast tract of land from New Orleans on the south to the British possessions on the north, and from the Mississippi on the east to the Rocky Mts. on the west. During the French war relations between Great Britain and the United States became strained, especially with regard to the right of search and impressment. In 1807 the British frigate the *Leopard* took four seamen, three of whom were Americans, from the *Chesapeake* while in American waters. The United States demanded redress, but it was not given for several years. In 1809 the non-intercourse law closed the ports to both British and French vessels. Jefferson's successor, James Madison, issued a proclamation that trade with Britain would not be resumed. At the same time Great Britain was believed to be inciting the Indians in the north-west to war with the settlers, and to be furnishing them with arms. Accordingly, in June 1812, the president, incited by Clay and Calhoun, declared war with Great Britain. The war began on the northern boundary, where the Americans in attempting to invade Canada met with "a disastrous repulse at Detroit; while the British, in their effort to cut through Michigan and Ohio, were defeated by the navy on Lake Erie, under Commodore Perry. Detroit soon fell to the Americans. In 1814 the Americans gained victories at Chippewa and Lundy's Lane, and by the successful naval engagement of Commodore Macdonough on Lake Champlain the British were driven back, and the war in the north closed. On the coast the British entered Chesapeake Bay, captured Washington, and burned the capitol and other buildings. They then attacked Baltimore, but were beaten off. In the far south General Andrew Jackson forced the surrender of the Creek Indians, marched into Florida, and forced the British to retire. He then proceeded to New Orleans, where he met Sir Edward Pakenham. In the engagement which ensued the British commander and a great number of men were killed. But peace had been declared before the battle was fought, although the fact was not known. The treaty was signed at Ghent in December. The war was of no particular advantage to either side, and closed with many important questions still unsettled. It had cost the United States nearly twenty millions sterling and thirty thousand lives.

A remarkable era of expansion now set in, and industrial pursuits were encouraged. In 1812 Madison was re-elected president.

In 1816 James Monroe was chosen president, and re-elected in 1820. The old Federalist party became extinct; yet their successors, the Democratic party, by the adoption of many of their opponents' principles, obliterated the original party lines. From the south came the cry for protection for the cotton interests, and the same was demanded by all manufacturers who were unable to compete with foreign markets; consequently, the first protective tariff law was enacted, and came into effect in 1816. By far the most important question of the administration arose over the admission of Missouri as a state. By an ordinance passed by Congress in 1787 no state north of the Ohio could come in as a slave state. Missouri, being south of this line, claimed the privilege of the constitution, and asked admission. Since 1789 nine states had been admitted, five of which were slave states. If a balance was to be maintained, it was now the turn of the free states. The subject aroused intense feeling, and disunion was threatened; but danger was averted for the time by the 'Missouri Compromise,' which provided that no state north of 36° 30' could hereafter come in as a slave state, and by the admission of Maine as a free state in 1820. The admission of Missouri followed in 1821. In his message to Congress in 1823 the president promulgated the so-called 'Monroe doctrine,' warning the states of Europe against interfering with any state on the American continent. In 1824 a tariff act was passed, increasing the duties on agricultural products and on metals. In that same year four parties came forward in the national election, all calling themselves Republicans. John Quincy Adams of Massachusetts was chosen president. He had been a Federalist, but with the dissolution of that party had become a Republican. The principles of former years were believed by his opponents to be maintained by him, and from the beginning of his administration he was subjected to unceasing opposition and criticism. In his effort to adjust the trouble with the Indians in Georgia he was unsuccessful; his popularity was not increased by the passage of the tariff bill of 1828, wherein the duties were greatly advanced. In the election of 1828 Andrew Jackson of Tennessee, a candidate in 1824, was chosen president. With the coming of Jackson a new epoch began. Almost his first act was to remove from office those who had opposed him, acting on the maxim that 'to the victors belong the spoils.' The tariffs

of 1828 and 1832 proved so unsatisfactory to the south that in 1832 S. Carolina assumed an independent attitude, and declared the tariff null and void. Jackson issued a proclamation denouncing the nullifiers, who in turn denounced him. Through the mediation of Virginia, a compromise bill passed in 1833. The next act of the president that awakened bitter feelings was his refusal to renew the charter of the National Bank. After his reelection Jackson's animosity was not decreased, since he believed that the bank had entered the campaign and taken part against him. Nevertheless the revenue of the government, under the higher tariff and through the sales of public lands, had greatly increased, and in 1835 the public debt, which in 1815 amounted to 254 millions sterling, was paid in full. The administration was now vexed with the question of the disposal of the surplus. Finally it was decided that the surplus should be distributed in quarterly payments to the states, and three such payments were made. Jackson's administration in foreign affairs was markedly successful. He secured to Americans the carrying trade to the W. Indies, which since the union of the states had been denied by Great Britain; and settled the difficulty with France regarding the depredations committed in the wars of Napoleon.

Van Buren was elected president in 1836, and fell heir to a difficult financial situation. Maize and flour doubled in value, and bread riots occurred in New York. The banks suspended payment in specie, and the president called an extra session of Congress. The Whigs declared that the attack on the bank and the compromise on the tariff were responsible for the crisis, while the Democrats insisted that it was due to the speculation of the bank before the deposits were withdrawn. About the only measure passed for the relief of the situation was the Independent Treasury Act, by which the government established its own depositories. This method is still employed.

In 1835 Texas had declared independence of Mexico, and received official recognition under Jackson. But Texas desired to be joined to the United States. This Van Buren declined to consider. The anti-slavery people opposed the annexation of Texas, as they saw that five new slave states would thus be created. Van Buren adjusted the boundary dispute with Great Britain respecting the north-east frontier, and closed the Seminole war with the Indians in Florida.

In 1840 the Whigs were able to

elect their candidate, William Henry Harrison. This party had been steadily growing since 1834, and nineteen out of the twenty-six states had shown a popular majority for Harrison. The new administration began a series of reforms. For the relief of the financial situation Clay recommended the establishment of a new National Bank, the repeal of the Independent Treasury Act, the imposition of a permanent tariff for the government service, a temporary loan, and the division among the states of the proceeds from the sales of the public lands. But Harrison died one month after going into office, and the vice-president succeeded to the presidency. John Tyler of Virginia was a Democrat, opposed to the National Bank; was a friend of slavery, and maintained that Congress had no right to dictate the prohibition of it in the territories. He had joined the Whigs only because he was not in full sympathy with the Democrats. He signed the repeal of the Independent Treasury Act, but vetoed the National Bank bill. Tyler secretly carried on negotiations regarding the admission of Texas, and submitted the treaty to the Senate, who, however, voted against it.

Under the administration of James K. Polk a settlement was reached on the question of the boundary of Oregon, between the United States and Great Britain. The adjustment of the Texas boundary was more difficult. The Mexican government claimed the Nueces R. as the boundary line; but to this the United States took exception, and Polk ordered General Taylor to occupy the western bank of the river. Early in 1846 Taylor came into conflict with the Mexicans at Palo Alto and Resaca de la Palma, then crossed the Rio Grande and took Matamoros. In May a formal declaration of war was issued. General Scott began a rapid campaign, which ended in the capture of the city of Mexico. This concluded the war, and in the subsequent treaty of Guadalupe Hidalgo, in 1848, Mexico gave up all claim to Texas, and ceded the territories of New Mexico and California, for which the United States paid \$15,000,000. The re-establishment of a subtreasury and the passage of a higher tariff were the two important internal measures of this administration. In the campaign of 1848 the Whigs elected Zachary Taylor, who was conciliatory to the anti-slavery movement. Two other candidates were in the field, and the Free Soil party, who supported one of them (Van Buren), polled a large popular vote. Their policy was opposition to slavery in the new states.

A great deal of excitement was

aroused in 1848 by the discovery of gold in California, and by 1850 80,000 settlers had gone there. The people in 1849 asked admission to the union as a free state, although part of the territory extended south of the line fixed by the Missouri compromise. Henry Clay, in view of a crisis, proposed another compromise, to the effect that California should be admitted as a free state, and that New Mexico should be organized without any provision as to slavery, leaving it a matter of choice to the inhabitants. This so-called 'Omnibus Bill' provoked serious debate, but finally passed both houses. In July 1850 Taylor died, and Millard Fillmore became president. Just before the death of Taylor the Clayton-Bulwer treaty was arranged between Great Britain and the United States for facilitating and protecting the construction of a ship canal between the Atlantic and the Pacific Ocean by the Nicaragua route, both governments agreeing to maintain the neutrality of such a waterway when completed. This agreement existed for fifty years.

In 1852 the Democrats elected Franklin Pierce as president. Both Democrats and Republicans expressed satisfaction with the compromise, but the Free Soil party denounced it. They polled, however, only a small vote. In the first year of Pierce's administration a settlement of boundary lines with Mexico was made at a cost of two millions sterling. This was known as the 'Gadsden Purchase,' and covered more than 45,000 sq. m., situated south of the Gila R.

The question foremost in the minds of the people was slavery. In the north the sentiment against it was growing, due to the agitation of the abolitionists, and to the literature of the day, represented principally by Mrs. Beecher Stowe's *Uncle Tom's Cabin*. In January 1854 Stephen A. Douglas of Illinois introduced a bill in the Senate for the organization of the territory of Nebraska preparatory to its admission as a state. The region lay to the north of the line of the Missouri compromise; nevertheless, the bill proposed that the question of slavery should be left to the choice of the settlers. A substitute finally passed dividing the section into two territories (Kansas and Nebraska), which were to be governed by all existing federal laws, except the one in regard to the admission of Missouri as a state. Efforts were made at once to gain control of Kansas, and settlers from both north and south began to pour into the territory. Serious warfare between the two factions

followed, but in 1857 the free settlers gained control, and obtained recognition as a territory. The wide difference of opinion as to the best way out of the situation resulted in the formation of political parties on new lines. In 1856 the Democrats nominated James Buchanan for president. They gave expression to their faith in the compromise of 1850, and endorsed the action of 1854 in the Kansas-Nebraska bill. The Republicans, who had now absorbed the Free Soil party, met for the first time in Philadelphia, and nominated John C. Fremont. Their policy was against the extension of slavery, and they demanded the admission of Kansas as a free state. The remnant of the Whigs accepted for their candidate President Fillmore, who had been nominated by the 'Know Nothings,' whose programme was concentrated upon the effort to evade the question of slavery. Buchanan was elected. With but four exceptions the Republicans carried the northern states, and the Democrats carried the entire south. From this time every other party gave way to these two.

Buchanan was obliged to meet a serious financial panic during the year 1857. Although the trouble in Kansas was finally settled in favour of freedom, the difficulty was intensified by the Supreme Court's decision (1856) in the Dred Scott case, according to which the slaveholder could carry his slaves into a free state and continue to be protected in his property rights. In 1859 John Brown, a free state settler in Kansas, went to Harper's Ferry in Virginia and seized the United States arsenal, intending to begin a forcible deliverance of the slaves by provoking insurrection; but the movement was suppressed, and its author executed for treason.

At the presidential election of 1860, owing to a split in the Democratic camp, the Republican candidate, Abraham Lincoln, was elected, but in Congress the Republicans did not hold a majority. Immediately upon the news of the election S. Carolina formally dissolved the union, and prepared for defence in case of war. By February, Georgia, Alabama, Florida, Mississippi, and Louisiana had followed this example of secession; and although they did not contemplate a permanent disruption, they thought they could make better terms out of the government than in it. Accordingly, a convention met in Montgomery, Alabama, in February 1861, and adopted a provisional constitution for the Confederate States of America, Jefferson Davis being chosen president.

The Federal government was, at the same time, greatly disconcerted by the resignation of many military officers, who entered the Confederate service. On April 12 the troops of S. Carolina fired on Fort Sumter, in Charleston harbour, a national fort, and it surrendered. War now began. The next day Lincoln called for 75,000 volunteers, and the response came quickly from the North. Arkansas, N. Carolina, Virginia, and Tennessee joined the seceding states, making about nine millions of people on that side. Maryland and Kentucky did not secede, but a large part of their population was in sympathy with the South. The Confederate or Southern capital was established at Richmond, and preparations began vigorously on both sides.

The victories at the beginning of the war were with the Confederates, and the national capital was greatly endangered by the retreat from Manassas. Almost at the outset the North barely escaped an unpleasant imbroglio with Great Britain, by the seizure of two Confederate envoys who had run the blockade and taken passage on the British mail steamer *Trent*. This breach of international law was immediately disavowed, and the envoys were surrendered. By 1862 the plan of the war began to develop. In the east the objective points lay between Washington and Richmond, the respective capitals; while in the west the armies sought to control the valley of the Mississippi. In the east, Robert E. Lee and 'Stonewall' Jackson began their brilliant and successful campaign against the Federal army, and the year ended with the overwhelming defeat of the North at Fredericksburg. The war in the west was, however, more successful. General Grant marched into the seceding country, took Corinth, and opened the Mississippi as far as Vicksburg, the river having been cleared below by the victory of Admiral Farragut at New Orleans. The capture of Memphis soon followed. The western counties of Virginia separated from the parent state in 1862, and in 1863 were admitted to the union as W. Virginia. Lincoln, although opposed to slavery, was at first adverse to freeing the slaves. But in September 1862 he proclaimed that, unless the seceding states returned to their allegiance by the first day of the ensuing year, he would declare the slaves free. By this act the sympathy of the European powers for the South was neutralized, and the dread that the Confederacy would receive foreign recognition was dissipated.

In 1863 the South lost Stonewall Jackson, one of its ablest commanders; and Lee, in his attempt to invade Pennsylvania, met with a bloody defeat at Gettysburg (July 1-3). At the same time the news of the capture of Vicksburg, by Grant, filled the North with renewed hope. This victory was followed by others at Lookout Mt. and Missionary Ridge. The persistent manner in which Grant succeeded made him one of the most conspicuous generals in the Union army; consequently, in 1864, he was given supreme command. Leaving Sherman in charge of the western army, he himself went east, where he assumed

live to complete the pacification of the country; for scarcely had the South surrendered when he was shot at Ford's Theatre by a demented Southern sympathizer, April 14, 1865, and died next day. Vice-president Johnson succeeded to the vacancy.

The theatre of war had been in the South, and the complete prostration of her interests was painfully evident when the conflict was over. The South was the stronger in the beginning of the war, when there were about 700,000 men in the field; but at the close they were reduced to about 175,000. The Federal forces, on the other hand, increased rapidly, and at the close of the war there

part, was obliged for many years to suspend specie payments, with the consequent evil results on the value of currency.

With the war closed and a new president in the chair, the reconstruction of the states became the chief issue. Andrew Johnson was a Southern man, but did not approve of secession, and became an ardent Union man. He was, however, in the main in sympathy with the South. But as the Republican majority controlled the situation, they passed laws over the president's veto. An important measure was the act admitting the negro to the privileges of the franchise, at the same time that the Confederate leaders were



control of the army of the Potomac. But he met with severe losses in the beginning of his campaign, and the long siege of Lee's fortified position was not broken until the spring of 1864, when Grant began to move upon the Confederate forces at Richmond and Petersburg. Lee was at last compelled, by the advance of Sherman, to evacuate Richmond, and made an attempt to reach the Confederate forces in the far south; but in this he failed, and on April 9 he was forced to surrender to General Grant at Appomattox Court House, but on honourable terms. Lincoln had been re-elected president in the preceding autumn, but did not

were over a million men under arms. The finances of both governments were a serious problem. By an increase of tariff duties and internal revenue the North met the situation in part, but was compelled to create a large debt. The South had issued treasury notes, and borrowed money on cotton; and when these expedients failed, other temporary measures were introduced from time to time. The collapse of the Confederacy left its obligations without value, and thus more weight was added to the economic depression of the home owners of its bonds. Recovery has been a matter of generations. The Federal government, on its

deprived of that privilege. The consequence was that the new legislatures of the Southern states fell into the hands of negroes or their white leaders, many of whom were adventurers from the North. This was the so-called 'carpet-bag' régime, which deeply embittered those engaged in the process of reconstruction. And they were still further embittered when Congress passed the Reconstruction Act, practically compelling the South to accept the arrangements it made; but it was as late as 1871 before all the states were again represented in Congress. President Johnson further provoked the antagonism of his party by his removal of the sece-

tary of war, thus violating the Tenure of Office Act. This was one step too far in the standing conflict of executive and legislature, and the House of Representatives proceeded to impeach him; but he was acquitted on his trial before the Senate. In 1867 an important acquisition was made in the purchase of Alaska from Russia for £1,450,000. The reconstruction of the union being still uncompleted, it became the chief issue of the electoral campaign of 1868. The Republican Convention in Chicago nominated General Grant, and his election followed without difficulty. Now the Southern states had a majority of negro votes. These the whites made an effort to control, and intimidation was carried on largely by the Ku Klux Klan, a secret society of whites. Federal intervention was used to protect the coloured vote. This was greatly resented by the whites, who persisted in the suppression of the black vote, if not the voter, and by 1876 had gained control of most of the Southern states. During Grant's term of office an interesting step in international comity was taken by Great Britain and the United States in the settlement of the so-called *Alabama* claims. The *Alabama* was a Confederate cruiser, built in England, which did great damage to Northern commerce. On complaint of this breach of neutrality, the two powers agreed to submit the matter to a board of arbitration. This commission met in Geneva in 1872, and awarded damages to the United States in the sum of £3,100,000.

The presidential election of 1872 placed Grant again in the chair. A financial panic in 1873 brought great distress to the people, and general disapprobation of the administration followed; consequently, the Democrats gained in the House of Representatives. The many instances of official corruption which were investigated by this house brought some of the chief representatives of the government into great disrepute, though scandal did not touch the president himself.

In the campaign of 1876 the conflict lay between Samuel J. Tilden, governor of New York, and Rutherford B. Hayes of Ohio. The election was bitterly contested, but Hayes was elected. In 1878 the Bland Silver Bill was passed, and specie payment was resumed. The secretary of the Treasury was authorized to purchase from time to time not more than four million dollars' worth of silver a month, and not less than two millions. This bill, thus coupled with a good currency act, was passed to

meet the demand from the west and south for an inflation of the volume of money.

In 1880 the Republicans elected James A. Garfield of Ohio president; but he was assassinated on July 2, 1881, by a disappointed and demented office-seeker. In July 1883 Congress finally passed the Pendleton Civil Service Act, authorizing appointments to be made by competitive examinations under the direction of a standing Federal commission. The presidency of Chester A. Arthur, who as vice-president succeeded, was uneventful. The South was perceptibly recovering from the effects of the war. Manufacturing industries, the building of railroads, the discovery of coal in the south, and the extension of cotton exports gave great impulse to commercial activity. In the election of 1884 protection, which had been steadily increasing since 1827, received its first serious check, and a Democrat was chosen president, clearly on the issue of a lower tariff. This was, in fact, the most important question of the first administration of Grover Cleveland, though few actual changes were in reality made. An important measure passed was the Chinese Immigration Act, which placed rigid restrictions upon the entrance of the Chinese into the country. The Contract Labour Act checked the evils of the 'padrone system' by forbidding the importation of labourers under previous agreement to give employment. The Presidential Succession Act provided that, in case of the disability of both president and vice-president, the members of the cabinet should follow in their order.

In the election of 1888 the issue again turned upon the tariff; but Cleveland was replaced by Benjamin Harrison of Indiana, Republican. This result was assumed to be an endorsement of protection. In 1890 William M'Kinley introduced into the house a bill to 'reduce the revenue of the Federal Government,' the surplus being for the year 1887 £22,000,000. The Bland Silver Bill was repealed, and the Sherman Law passed. This directed the purchase of a larger amount of silver each month, and the issue of Treasury notes of the United States in payment of the bullion.

The policy of protection, however, received a check in 1892, when Grover Cleveland was elected for a second term. Early in the year it was evident that a business crisis was approaching. The extravagant coinage of silver and the large exports of gold were believed to be responsible for the panic. The price of sil-

ver fell to its natural market value, and caused the closing of many mines. The Wilson Tariff Bill reduced the rates of duties on many imports, and largely abolished them on raw material from abroad. A serious international episode occurred respecting Venezuela and Great Britain, who were in conflict over the boundary of British Guiana. After fruitless attempts to induce Great Britain to arbitrate the question, the president appointed a commission with power to determine the limits of the two countries. This was in conformity with the principles of the Monroe doctrine; but while the commission was deliberating the two contestants came to an understanding, and further investigation was dropped. But more serious events soon followed. The operations of the Spanish government in Cuba caused a rebellion there in 1894. Much sympathy was expressed for the islanders by the people of the United States. Meanwhile a sentiment had been growing in favour of the free coinage of silver. This was in part the periodical recurrence of the demand for inflation of the currency, and in part the pressure of the mine-owners. In 1896 William J. Bryan was nominated candidate for the presidency as the champion of this policy. William M'Kinley, the apostle of protection, was chosen as the Republican candidate, and their policy spoke unequivocally for a gold basis. After a most exciting campaign M'Kinley was elected. He at once turned his attention to the tariff. The Dingley Bill increased once more the duties to a higher protective point, and even included articles which had hitherto been free.

The United States battleship *Maine* went to Havana in January on a friendly mission, and whilst in the harbour was, on Feb. 15, 1898, destroyed by an explosion, together with 266 of the crew. The inquiry which followed showed that the catastrophe was due to a submarine mine, exterior to the boat. On April 25 Congress made a formal declaration of war. In the meanwhile the Pacific fleet under Admiral Dewey had been sent to the Philippine Is., an Eastern possession of Spain, and there meeting the Spanish fleet in Manila Bay, completely destroyed it (May 1, 1898). Upon the arrival of General Merritt with American troops the city of Manila was occupied.

In the Atlantic waters a blockade was established on both coasts of Cuba, while troops were landed on the south-east. Admiral Cervera sailed with a fleet from Spain, and entered the bay of Santiago. The American army

having been successful in the land engagements near Santiago, Cervera, on July 3, attempted to escape, but the attempt resulted in the destruction of his entire fleet by the American navy. Santiago surrendered on July 17. After this an expedition under General Miles to Porto Rico was undertaken, and by the middle of August the Americans gained control of the greater part of that island. The treaty of peace between the two nations was signed in Paris in December 1898. Cuba was declared free, Porto Rico, the island of Guam in the Ladrones, and the Philippines were surrendered to the United States. In settlement of the

government and played a great part in the development of the west. In 1900 William M'Kinley was again a candidate, with practically the same programme as four years before. William J. Bryan was again nominated by the Democrats as a silver advocate, with anti-imperialism as an additional war cry. The vote was more decisively than before in favour of sound money, and M'Kinley was returned. During the first year of his second term, and while attending the Pan-American Exhibition at Buffalo, he was assassinated by an alien anarchist, and died Sept. 14, 1901. Theodore Roosevelt, formerly governor of New York, the vice-

lish Colonies in America (1881) are excellent surveys of the subject. John Fiske, in his *Beginnings of New England* (1889), *Old Virginia and her Neighbours* (1897), *The American Revolution* (1891), and *The Critical Period of American History* (1898), gives the results of later inquiry. M' Master's *History of the People of the United States* (6 vols. 1883) emphasizes social development. J. Schouler's *History of the United States under the Constitution* (1880-91) brings the subject from 1783 to the civil war. J. F. Rhodes, in his *History of the United States since the Compromise of 1850* (1893), has given the best treatment of the issues of that struggle. Henry



United States—Territorial Development.

public property in the Philippines Spain received the sum of £4,000,000. In 1899 Hawaii too was annexed. In the Philippines the occupation of the country by the Americans was resented by a part of the inhabitants, under the leadership of Aguinaldo, who demanded independence. They offered a stubborn though desultory resistance; but in 1901 Aguinaldo was captured, and took the oath of allegiance.

Other important measures adopted during M'Kinley's first term of office were the revision of the Clayton-Bulwer treaty, and the sale of the Union Pacific and Kansas Pacific railroads, which had been subsidized by

president, then became president. He pursued in general the policy of the Republican party. In May 1902 Cuba, having adopted its own constitution, was declared free from American protection. In the election of 1904 President Roosevelt easily secured his re-election.

Bibliography.—For the early period Winsor's *Narrative and Critical History of America* (8 vols. 1885-9) is the most comprehensive. George Bancroft's *History of the United States* (6 vols. 1885), a classic, brings the subject through the revolutionary period. J. A. Doyle's *History of the American Colonies* (1869) and H. C. Lodge's *Short History of the Eng-*

lish Colonies in America (1881) are excellent surveys of the subject. John Fiske, in his *Beginnings of New England* (1889), *Old Virginia and her Neighbours* (1897), *The American Revolution* (1891), and *The Critical Period of American History* (1898), gives the results of later inquiry. M' Master's *History of the People of the United States* (6 vols. 1883) emphasizes social development. J. Schouler's *History of the United States under the Constitution* (1880-91) brings the subject from 1783 to the civil war. J. F. Rhodes, in his *History of the United States since the Compromise of 1850* (1893), has given the best treatment of the issues of that struggle. Henry

versity. Materials for the history of the Pacific coast will be found in the monumental collections of H. H. Bancroft (39 vols. 1882-90).

Literature.—American literature begins with two narrative works—Captain John Smith's *True Relation of Virginia* (1608) and William Strachey's *The Wrack and Redemption of Sir Thomas Gates* (1610); but its earliest productions are almost exclusively theological, such as Roger Williams's *Bloody Tenet of Persecution for Cause of Conscience* (1644) and Cotton Mather's *Magnalia Christi* (1702), and the only early name of universal importance is that of the metaphysical Puritan divine, Jonathan Edwards (1703-58). A new era opens with the war of independence, round which cluster the names of Benjamin Franklin (1706-90), and Madison, Jay, and Hamilton, the writers in the *Federalist*. The Quaker John Woolman (1720-73) claims notice in virtue of his *Journal* and miscellaneous tracts; while the verse of the day is exemplified in John Trumbull (1750-1831) of the Hudibrastic *M'Fingall*, Timothy Dwight (1752-1817) of *The Conquest of Canaan*, and Philip Freneau (1752-1832). The second quarter of the 19th century saw the beginning of the real flowering of American literature. The defence of rationalistic religion undertaken by W. E. Channing (1780-1842) and Theodore Parker (1810-60) found its philosophical counterpart in the transcendental school, whose chief exponents were Margaret Fuller-Ossoli (1810-50), Ralph Waldo Emerson (1803-82), and H. D. Thoreau (1817-62). Poetry blossomed out in the works of William Cullen Bryant (1794-1878), Henry W. Longfellow (1807-82), Edgar Allan Poe (1809-49), James Russell Lowell (1819-91), John Greenleaf Whittier (1807-92), Oliver Wendell Holmes (1809-94), and Walt Whitman (1819-92). More recent times have produced no great poets, the best of the younger generation being perhaps Sidney Lanier (1842-81) and J. W. Riley (b. 1854). In history the middle of the century is represented by George Bancroft (1800-91), W. H. Prescott (1796-1859), John Lothrop Motley (1814-77), and George Ticknor (1791-1871), the most notable of whose numerous successors are Francis Parkman and John Fiske. The American novel dates its origin back to the terror tales of Charles Brockden Browne (1771-1810), being continued through the tales of Washington Irving (1783-1859) and J. Fenimore Cooper (1789-1851), until it culminated in the work of Nathaniel Hawthorne (1804-64). Since his

day the form has been employed with effect by Mrs. Harriet Beecher-Stowe (1812-96), W. D. Howells (b. 1837), F. Marion Crawford (1845-96), Henry James (b. 1843), George W. Cable (b. 1844), and Bret Harte (b. 1839). Among the numerous American humorists whose works reach a high level are Samuel C. Clemens ('Mark Twain'), Artemus Ward, Bret Harte, and James Russell Lowell. See Coit Tyler's *History of American Literature* (2 vols. 1878; new ed. 1881), Edmund C. Stedman's *Poets of America* (1885), C. F. Richardson's *American Literature* (2 vols. 1887-9), Stedman and Hutchinson's *Library of American Literature* (11 vols. 1887-9), John Nichol's *American Literature* (1882), and Trent's *American Literature* (1903).

United States Weather Bureau, or WEATHER SERVICE, arose from a system of weather observations started in 1807, while in 1819 climatological observations were instituted by the Army Medical Staff. In 1847 the Smithsonian Institution initiated a system of stations which extended over the greater part of N. America. As early as 1864 it was found that storm warnings for the region of the great lakes were possible, and in 1869 weather predictions were commenced by the Cincinnati observatory, and on Feb. 9, 1870, the secretary for war was authorized to take observations. On Oct. 1, 1890, this duty was transferred to the department of agriculture, and the organization was designated the Weather Bureau. The headquarters of the service are at Washington. Valuable work is done in the scientific exploration of the upper air by means of kites. See METEOROLOGICAL OFFICE.

United Steamship Line of Copenhagen is the principal undertaking of the kind in Denmark, and was established in 1866. It maintains services to the United Kingdom, Russia, United States, Germany, etc., and possesses a fleet of 123 steamers, aggregating 150,000 tons.

Units are those quantities in terms of which measurements are expressed.

Dynamical Units.—In the British absolute system the fundamental units are the foot (length), pound (mass), and second (time), the unit of force being the poundal or force which, acting on one pound for one second, generates a velocity of one foot per second.

This force is $\frac{1}{g}$ or $\frac{1}{32.2}$ of the force

with which the earth attracts one pound weight at sea level at Greenwich. The unit of work is the foot-poundal. Owing to complex tables of weights and meas-

ures, calculations in the British systems are somewhat laborious.

In the British gravitation or engineer's system, with the same fundamental units of length and time, the unit force is that due to the weight of one pound. The unit of mass is therefore that of 32.2 lbs. The unit of work is the foot-pound.

The metric system and the C.G.S. (centimetre-gram-second) system are now becoming universal. The units are connected simply, and as decimal notation is used, calculation becomes easy. It has the disadvantage that its units of force and work (dyne and erg) are extremely small, and hence many quantities used by practical men have to be expressed in very large numbers.

Gravitational units, however, are also used, the weight of one gram or a kilogram (1,000 grams) being used as a unit of force.

Units of surface and volume are got by squaring and cubing the units of length. Derived units are those of velocity, acceleration, force, etc. As an example of a derived unit, the unit of force is that force which, acting on unit mass for unit time, gives to it unit velocity—i.e. a velocity of unit distance in unit time.

Dimensions of Units.—A length (L) is of 1 dimension, an area (L²) of 2 dimensions, and a volume (L³) of 3 dimensions. A velocity (length ÷ time) $\frac{L}{T}$ or LT⁻¹ is of

1 dimension in length and (-1) in time. The dimensions of other units are derived similarly; for instance, a force is MLT⁻², and work is ML²T⁻².

From the C.G.S. system the two systems of electrical units, electrostatic and electro-magnetic, are derived. The former is based on the force exerted between two quantities of electricity, the latter on the force between two magnetic poles.

Electrostatic Units.—Unit quantity of electricity is chosen as that which repels a similar quantity at unit distance with unit force. Unit current conveys unit quantity in unit time, while unit E.M.F. exists between two points when unit current flowing between them does unit work. Hence the units of resistance and capacity are derived.

Magnetic Units.—Unit magnetic pole repels unit like pole in air with unit force. The strength of a magnetic field is measured by the force acting on unit magnetic pole at that point, unit field acting on unit pole with unit force. See MAGNETISM.

Electro-magnetic Units.—Unit current is that current which, in a circular arc of unit length and unit radius, acts on unit

TABLE OF UNITS.

Unit and Dimensions.	Absolute.	Gravitational.	
	C.G.S.	Metric.	British.
Length, L.....	1 centimetre.	1 centimetre.	1 foot = 30.48 cm.
Mass, M.....	1 gram.	1 gram.	1 pound = 456.3 gm. (abs.), 32.2 lbs (Eng.).
Time, T.....	1 second.	1 second.	1 second.
Area, L ²	1 sq. cm.	1 sq. cm.	1 sq. in. = 6.45 sq. cm.
Volume, L ³	1 c.c.	1 c.c. (1 c.c. water weighs 1 gm. 1 litre hydrogen weighs .09 gm.)	1 gallon = 4,546 c.c. (1 gallon water weighs 10 lbs. 1 c. ft. water weighs 62.5 lbs.)
Velocity, $\frac{L}{T}$	1 cm. per sec.	1 cm. per sec.	1 ft. per sec. = 30.48 cm. per sec.
Acceleration, $\frac{L}{T^2}$	1 cm. per sec. per sec.	1 cm. per sec. per sec.	1 ft. per sec. per sec.
Force = $\frac{\text{mass} \times \text{acceleration}}{\text{area}} = \frac{ML}{LT^2}$	1 dyne.	weight of 1 gm. = 981 dynes.	1 poundal = 13,800 dynes (abs.). weight of 1 lb. = 445,000 dynes (Eng.).
Pressure = $\frac{\text{force}}{\text{area}} = \frac{M}{LT^2}$	1 dyne per sq. cm.	1 gm. wt. per sq. cm. = a column of .0733 cm. mercury = .000,678 atmosphere.	1 lb. per sq. in. = 6,897 dynes per sq. cm. = 70.31 gm. per sq. cm. = col. of 27.6 in. water = col. of 5.17 cm. mer. = .068 atmosphere.
Work } Energy } = $\left\{ \begin{array}{l} \text{force} \times \text{length} \\ \frac{ML^2}{T^2} \end{array} \right.$	1 erg. 107 ergs = 1 Joule.	1 gm. cm. = 981 ergs. 1 kg. m. = 100,000 gm. cm. 1 B.T.U. = 1 kilowatt hour = 3,600,000 Joules.	1 ft. lb. = 1,356 × 107 ergs = 13,826 gm. cm. 1 H.P. hour = 2,684,340 Joules = 1,980,000 ft. lbs.
Power = work per sec. $\frac{ML^2}{T^3}$	1 erg per sec. 107 ergs per sec. = 1 Joule per sec. = 1 watt.	1 gm. cm. per sec. = 981 ergs per sec. 75 kg. m. per sec. = 1 cheval vapeur = 736 × 107 ergs per sec.	1 H.P. = 550 ft. lbs. per sec. = 33,000 ft. lbs. per min. = 746 watts.
Heat (energy).....	1 erg.	1 calorie = 1 gm. water heated 1° C. = 4,184 Joules. = 427 kg. m. = 3.09 ft. lbs. = .00,116 kilowatt hour.	1 B.Th.U. = 1 lb. water heated 1° F. = 252 calories = 10,540 Joules = 773 ft. lbs. = .000,393 H.P. hour.

ELECTRICAL UNITS (ELECTRO-MAGNETIC).

UNIT AND DIMENSION.	ABSOLUTE.	PRACTICAL.
Current, $\sqrt{\frac{ML}{T}}$	Unit current exerts a force of 1 dyne on unit magnet pole when passed through an arc 1 cm. long 1 cm. from it.	1 ampere = 1 absolute unit.
Quantity = current × time. $\sqrt{\frac{ML}{T}}$	Unit current for 1 sec.	1 coulomb = 1 absolute unit, and deposits .001,119 gm. silver per sec.
Electromotive force = $\frac{\text{work}}{\text{quantity}} = \sqrt{\frac{ML^2}{T^2}}$	Unit difference of potential exists between two points when it requires 1 erg to bring unit quantity from one to the other.	1 volt = 10 ⁸ absolute units = .697 the E.M.F. of a Clark cell.
Resistance = $\frac{\text{E.M.F.}}{\text{current}} = \frac{L}{T}$	Unit resistance is that through which unit E.M.F. drives unit current.	1 ohm. = 10 ⁹ absolute units. = resistance of 106.3 cm. of mercury of 1 sq. mm. cross section.
Energy.....	1 erg.	1 B.T.U. = 1 volt × 1 amp. × 1 hr. × 1,000.
Power.....	1 erg per sec.	1 watt = 1 volt × 1 ampere = 1 volt × 1 coulomb per sec. = 1 Joule per sec.

pole at the centre with unit force. Unit quantity is conveyed by unit current in unit time. Unit E.M.F. is generated in a conductor of unit length moving with unit velocity in unit field. From these the units of resistance and capacity are derived. See table, p. 6101.

Univalves, a name sometimes given to gastropods on account of the single shell, as compared with the double shell of bivalves.

Universal, the general nature or essence common to or manifested in a class of individuals, and mentally represented by the general concept or common name: for example, 'man' or 'humanity' is the universal in

ally Origen—the final restoration of all created beings, and the complete eradication of evil from the universe. Many of the modern Universalists are also Unitarians. See Dean Farrar's *Mercy and Judgment* (1881), and Eddy's *Universalism in America* (1884-6).

Universal Language, a language that should be capable of serving as an easy means of communication throughout the world. All through the middle ages and down to the reformation Latin served this purpose. For many years French was the most widely spread language, as it still continues to be the speech of diplomacy; but in point of vogue English appears now to be gaining

in 1883 four time zones were established in N. America, differing severally by five, six, seven, and eight hours from Greenwich time, minutes and seconds being neglected. These conventionalized times are named Eastern, Central, Mountain, and Pacific; and an Atlantic zone, four hours slow upon Greenwich, was added. Of late the method has been extended to most parts of the globe. Greenwich or Western European time is kept by Holland and Belgium, Spain and Portugal; Mid-European time, one hour fast on Greenwich, by Sweden, Denmark, Germany, Austria, Italy, and Servia; Eastern European time, two hours

The World rotates from West to East →



Universal Time Chart of the World.

relation to which the individual man is the particular. For the great mediæval controversy as to the metaphysical significance of universals, see SCHOLASTICISM, NOMINALISM, REALISM, and CONCEPTUALISM.

Universalists, a Christian sect found mainly in America, though it owed its origin to John Murray (1741-1815), an English minister, who gathered a congregation at Gloucester, New Jersey, in 1774. (See also DUNKERS.) Hosea Balou (1771-1852) was also a noted leader in America. The doctrine which distinguishes the sect is that which received countenance from St. Gregory of Nazianzen, St. Gregory of Nyssa, and especi-

ally Origen—the final restoration of all created beings, and the complete eradication of evil from the universe. Many of the modern Universalists are also Unitarians. See Dean Farrar's *Mercy and Judgment* (1881), and Eddy's *Universalism in America* (1884-6).

Universal Time, a system of time determination uniform throughout the world. It is also called 'zone time,' because local time is replaced by standard time, invariable over zones 15° wide. The idea of thus universalizing time originated with Dowd of Saratoga in 1870; and

fast, in Bulgaria, Turkey, and Egypt. The following countries have adopted standard times by various amounts in advance of Greenwich: British South Africa, 2 hours; India, 5½ hours; Burma, 6½ hours; Australia, 8 hours, 9½ hours, and 10 hours; New Zealand, 11½ hours; Eastern China, 8 hours; Japan, 9 hours. France will probably soon observe Greenwich time; but Ireland holds aloof from the universal system.

Universities. Universities as institutions were not founded; they grew out of the nature of things. The natural tendency of learned men to gather together for mutual help led to a pro-

cess of segregation in suitable districts, often at certain schools connected with cathedrals or abbeys. The beginning of the university system may be placed at about the end of the 12th century. The teaching was not limited to students from one district or even from one country, and involved the idea of more or less specialized instruction; indeed it soon involved the possession of one at least of the higher faculties, in addition to the arts faculty, that is for one of the three— theology, law, and medicine. Men wanted to be allowed to follow the bent of their own intellect, and to work out the conclusions to which they were led irrespective of tradition or theology. Obviously this was impossible in the schools under the direct control of the church. Hence at the beginning there was a considerable amount of jealousy on the part of the church in respect of the universities. This was finally overcome by the central authorities of the church using the universities as far as possible for their own ends. At the end of the 12th century there were three pre-eminent universities in Europe—Paris for theology, Bologna for law, Salerno for medicine. Universities were founded or recognized by a bull from the pope or from the emperor. In this way Frederick II. founded the University of Naples, Gregory IX. founded that of Toulouse, while Innocent IV. founded the university at the pontifical court itself. At Bologna, for example, there were really four universities forming the famous *studium generale* of that city. These were the Lombards, the Ultramontans, the Tuscans, and the Romans. Clearly 'university' is here used in the sense of guilds of men brought together for the purpose of organized study. They represent the 'nations' which play such an important part in the organization of the mediaeval universities. In Paris, for example, we have also four nations based on the Bologna model—the French (including all who used the Romance languages), the Picardians, the Normans, and the English (though at a later stage this nation came to be called the Germans).

There are two great types of mediaeval universities—one represented by Bologna, the other by Paris. The Bologna type is known as the 'students' university'; the Paris type is the 'masters' university.' At Bologna the university consisted of a body of students who hired professors to teach them. The government of the institution was entirely in the students' hands, the highest

executive officers being the two rectors who were elected by the students and were responsible to them. The university, in fact, was a great technical school carried on by students who were mature enough to know what they wanted and to see that they got it. In Paris, on the other hand, the students were treated by the professors as apprentices, their ages being much lower than at Bologna. The executive head was originally the chancellor, who represented an external authority, though at a later stage the rector acquired the real power and control, since the right of collecting and paying out money came to him as the representative of the faculty of arts. The history of the University of Paris typifies the history of the university movement throughout Europe, and consists in a long struggle for freedom. The University of Paris may be said to have grown out of the cathedral school of Notre Dame. The date of foundation has given rise to considerable controversy. The earlier date is 'not much before 1140'; the later date is 'about 1170.' The privileges of the University of Paris may be taken as typical of those of all similar institutions. The first of these is 'benefit of clergy,' and with it went exemption from all rates and taxes, from military service, and from civil jurisdiction. When the octroi dues were specially burdensome, this privilege was highly valued, and really corresponded to a positive annual income as compared with the case of those to whom the privilege was denied. Freedom from civil jurisdiction meant that all those entitled to the 'benefit of clergy' could claim to be tried, not by the ordinary civil courts, but by the clerical court under whose authority they lived. The second was the privilege a university man had of having any suit brought against him tried at his university town. The third important privilege was the right of non-residence and the enjoyment of ecclesiastical offices and salaries. A clergyman could thus desert his charge for a certain number of years without forfeiting his stipend, so long as he was on the books of the university. One of the most valuable rights of the university was the official recognition of the right of stopping of all lectures and sermons. Practically all the city clergy of Paris were connected in one way or another with the university, so that the stopping of lectures and sermons meant the suspension of all religious observances and privileges in the city. In addition to the four major university rights, there were many petty

privileges accorded to the students. For example, certain places were reserved for them at public entertainments; in some universities a distribution of pastry had to be made to them on feast days; in others, at carnival times, the Jews were compelled to make them certain presents; and in many cases a special tariff of lodgings and food stuff was composed for their benefit.

The mythical connection of Oxford with Alfred the Great is now discredited. Like Paris, the university cannot claim any definite date of foundation, but it may not unreasonably claim to date from 1167, or two years later. Though no doubt there was educational work of some sort going on there at an earlier date, it appears that Cambridge became a *studium* largely as the result of an emigration from Oxford in 1209. The college system, which forms such a characteristic part of the Oxford and Cambridge organization, really originated in Paris. Pious founders established endowments for the maintenance of a certain number of poor scholars during their university course. The hostels conducted under these endowments were usually under the superintendence of a master, who exercised a certain control over the students, and at the same time gave them some help in their studies. In Paris and in Oxford, however, the system developed in opposite directions. In the French capital the university maintained its pre-eminence in all that concerned the teaching, while at Oxford and Cambridge the colleges gradually monopolized the actual teaching of the students, the university confining itself to general organization, and in particular to the regulation of graduation. The halls that grew up along with the colleges seem to have differed from them only in the fact that they had no endowment. They began originally as voluntary associations of students for the purpose of obtaining the advantages that come from co-operation in housekeeping.

In the earlier Scottish universities (St. Andrews, 1411; Glasgow, 1450; Aberdeen, 1494) the college system was established; yet though in the case of St. Andrews the colleges became so far independent as to examine for their own degrees, the universities still retained their teaching functions. When Edinburgh University was founded (1582), it naturally fell into line with the others.

The university system of Germany is of later origin than those of France, Italy, and England. In their development the German universities followed the

French rather than the English form. Their universities are teaching institutions, very much on the lines of the Scottish universities, with their specialist professors. Both in Germany and in Scotland the universities have developed into institutions provided with endowments for professors rather than for students, but as a consequence the students benefit by the remarkably low fees charged for attendance at professorial lectures.

The modern idea of a university is different. The professors have to teach, no doubt, but they have also 'to advance their subject.' Hence the teaching of

sities, the newer English universities, and the two universities of Ireland admit women to both examinations and degrees in arts and science. In medicine there are still some limitations to the university instruction of women, and in law and divinity the universities are still closed against them.

The classical work on the universities is Denifle's *Die Entstehung der Universitäten des Mittelalters* (1885). In English the subject is best treated in Hastings Rashdall's *The Universities of Europe in the Middle Ages* (2 vols. 1895). The subject is dealt with in smaller compass in S. S.

to be nothing of the essential missionary character about the settlement. The men were to live their own lives, work for their own living, and share as citizens in the duties to the neighbourhood. The suggestion was taken up by influential men in Oxford and Cambridge. The first settlement was opened in Whitechapel in 1884. It was called Toynbee Hall, after Arnold Toynbee, who had been one of the earlier visitors at St. Jude's. Other settlements followed—Oxford House, Cambridge House, Bermondsey Settlement, Mansfield House, and Women's University Settlement in Blackfriars Road. America took up



University Settlements.

Bermondsey Settlement—1, Gymnasium; 2, Dining-room; 3, General view. 4, Oxford House.

undergraduates is being more and more entrusted to younger or less learned professors *who can teach*. At the same time the newer British universities have largely developed into technological colleges, in which the pure arts and sciences are taking an increasingly subordinate place. (For dates of newer universities, see under EDUCATION.) Throughout Britain the universities are becoming the centres for the training of teachers, which after all is only a reversion to their original function. The two older universities still refuse to grant the degree to women, though admitting them to the examinations open to men. All the Scottish univer-

sities, the newer English universities, and the two universities of Ireland admit women to both examinations and degrees in arts and science.

University College, LONDON. See LONDON—University.

University Extension. See LECTURES.

University Settlements developed out of the practice adopted in the 'seventies by some Balliol College (Oxford) men of spending parts of their vacation at St. Jude's Vicarage, Whitechapel, London. In 1883 Mr. Barnett, the vicar of that parish, recommended that university men should live together in small communities amongst the industrial poor, so that they might keep up the ways and manners of university life. There was, however,

the idea, and founded Hull House at Chicago.

Unja, tn., Baroda state, Gujarat, Bombay Presidency, India, 52 m. n.w. of Ahmedabad. Pop. (1901) 11,500.

Unlawful Assembly. See ASSEMBLY, UNLAWFUL, and RIOT.

Unleavened Bread, bread made without leaven or harm. It is used in the Roman Catholic Church for the celebration of mass and the administration of the eucharist. The Feast of Unleavened Bread is a Jewish festival, so connected with that of the Passover that the two are all but identical. It celebrated the fact that in the exodus from Egypt, on the night when the Passover

lamb was killed, there was no time to bake bread with leaven.

Unna, tn., Westphalia, Prussia, 10 m. E. of Dortmund; has coal-mining and iron-founding. In the vicinity are the salt works, springs, and bathing establishment of Königsborn. Pop. (1900) 14,912.

Unreason, ABBOT OF. See ABBOT OF UNREASON.

Unsaturated Compounds. According to the theory that the valency of the atom is fixed, certain compounds exist in which the possible power of attaching atoms does not appear to be exhausted. Thus, if carbon is quadrivalent, oxygen divalent, and hydrogen monovalent, such compounds as carbon monoxide ($C = O$), ethylene ($H_2 = C - C = H_2$), and

acetylene ($H - C \equiv C - H$) are not fully saturated. An alternative possibility is that double and triple unions may take place—e.g. $H = C = C = H_2$ and $H - C \equiv C - H$; and although this idea is not supported by the ease with which addition products are formed, by the measurements of specific volume and heat of combustion, or the results of oxidation—all of which point to a weaker rather than a stronger union—yet no cases are known where possible vacant affinities are not present in pairs. See VALENCY.

Unsoundness. See WARRANTY.

Unst, the most northerly of the Shetland Islands, Scotland, $37\frac{1}{2}$ m. N.E. of Lerwick; has an area of 46 sq. m. Fishing and agriculture are the chief employments. Pop. (1901) 1,940.

Unterwalden, Swiss canton, German-speaking and Romanist. It was one of the original three Swiss cantons, and is divided into two halves, each of which has its own democratic assembly—viz. Obwalden (cap. Sarnen) and Nidwalden (cap. Stans). Total area, 295 sq. m.; pop. (1900) 28,287.

Unwin, MARY. See COWPER, WILLIAM.

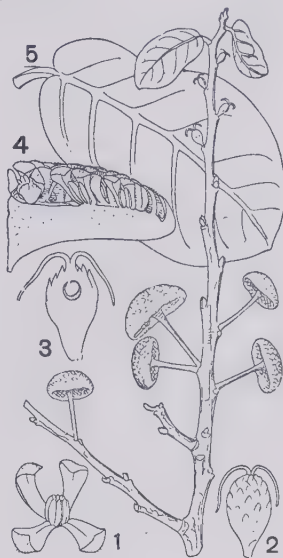
Unwin, WILLIAM CAWTHORNE (1838), English civil engineer, was born at Coggleshall, Essex. He was instructor at the Royal School of Naval Architecture and Marine Engineering at Kensington (1868-72), and at Cooper's Hill (1872-85); dean and professor at the Technical College, Kensington (1885-96). He is the author of *Wrought Iron Bridges and Roofs* (1869), *The Elements of Machine Design* (1901), and *The Testing of Materials of Construction* (ed. 1899).

U.P., United Presbyterian.

Upnishads. See VEDANTA.

Upas Tree, a tree (*Antiaris toxicaria*) belonging to the order

Urticaceæ. It is a native of Java, and is celebrated largely by virtue of a legend that nothing can live within its shade. This is untrue, but its juice and gum are intensely poisonous.



Upas Tree.

1. Male flower; 2. female flower; 3. do., section; 4. half of involucre (section); 5. large leaf.

Upolu. See SAMOA.

Upper Senegal-Niger. See SENEGAMBIA and NIGER.

Upper Sindh Frontier, dist. on N.W. border of Sindh, Bombay Presidency, India, with an area of 2,139 sq. m., consisting of a narrow plain, covered in some parts with dense jungle, and irrigated in others by the waters of the Indus. The administrative headquarters are at Jacobabad. Pop. (1901) 232,045.

Uppingham, mrkt. tn., Rutland, England, $6\frac{1}{2}$ m. S. of Oakham; famous for its public school, founded by Archdeacon Johnson (1584). The modern school was organized by Edward Thring (headmaster, 1853-87), under whom the present extensive buildings were mainly erected. Pop. (1901) 6,809.

Upsala, tn., cap. of co. of same name, Sweden, 41 m. N.W. of Stockholm; has a castle and cathedral (built 1260-1435), with the monuments of many kings and famous men (e.g. Linnaeus)—restored 1885-93. The university, founded in 1477, has the largest library in Sweden (300,000 vols. and 12,000 MSS.), and is attended by 1,500 students. Upsala has chemical factories, breweries, and brick works. It is the see of an archbishop. About three miles

away lies old Upsala, now a mere village, close to which are three vast historic mounds. Pop. (1900) 22,855.

Ur. See ABRAHAM, BABYLONIA, and EDESSA.

Uremia, a morbid condition which occurs in association with deficiency of urea excretion. It is most frequently due to nephritis, but may be the result of obstruction of the ureter. According to some, the urea and other waste products accumulate in the blood and poison the nerve centres. Others consider that the symptoms depend on oedema of the brain, and that to this mechanical factor the chemical action of toxic agents is altogether subordinate. Uremia is characterized chiefly by cerebral disturbances, by dyspnoea, and by gastro-intestinal symptoms. Headache, convulsions, and coma are frequent. Purgatives and sudorifics are indicated in order to promote excretion. Occasionally bleeding is useful. Chloroform and chloral may be necessary when convulsions occur, and for restlessness and delirium morphine is indispensable, although opium and its preparations are usually contraindicated in kidney disease.

Ural, or YAIK, riv., Russia, tributary of the Caspian, and in part of its course forming the frontier between the European and Asiatic provinces of the empire. It rises in the S. Ural Mts., at 2,070 ft. above sea-level, and flows first S. (to Orsk), then S.W. (to Uralsk), then S. again to Gurev and the sea. Its length is 900 m.; its basin area 96,000 sq. m.; at Orenburg it is ice-free for two hundred days yearly. Below Uralsk it is the great fishing-ground of the Ural Cossacks.

Ural-Altaic, in ethnology, a term which has superseded the now obsolete Turanian, and is practically synonymous with Mongolo-Tartaric, the one being geographical, the other ethnical. But both are alike defective, in that they fail to cover the whole area occupied by this division of mankind. The Ural-Altaic ethnical group no longer coincides with the Mongolo-Tartaric (better Turkic) linguistic group, for the European Finns, Magyars, and Turks still speak Ural-Altaic languages, but their physical type is now European, while the European Bulgarians are now of Slav (Aryan) speech, but still betray greatly modified physical Mongoloid characters. So in Asia the Anatolian Turks and many Central Asiatic Turks are of almost normal European type, but all, without exception, of Turki speech. On the other hand, the Japanese and Koreans, besides the Gilyaks, Koryaks, Chukches,

Yukaghirs, and other Siberian aborigines, are physically Mongols, while all of them speak non-Mongol languages. Hence, no systematic classification of the Ural-Altaic peoples is possible. See H. Winkler's *Die Uralaltaische Völker* (1895), *Del Rémusat's Recherches sur les Langues Tartares* (1820), H. Vambery's *Das Türkenvolk* (1885), and *Vigurische Sprach-Monumente* (1870), A. H. Keane's *Man, Past and Present* (1901), and 'Ural-Altaic Languages,' in *Encyc. Brit.* (9th ed.).

Uralite. (1.) A mineral, a variety of amphibole derived from pyroxene. It has the crystalline form of augite and the physical properties of hornblende, and is found in the Ural Mts. and elsewhere. (2.) A fireproof building material, composed of asbestos fibre with a proportion of sodium silicate and bicarbonate and some chalk.

Ural Mountains, a range on the N.E. of European Russia, stretching nearly N. and S. from the Kara Sea (Arctic Ocean) towards the Caspian. The length is over 650 m.; its extreme breadth almost 90 m.; its average height is from 1,200 ft. to 1,500 ft., with extreme elevations (Tölpos-Iss, Sablya) of from 5,000 ft. to 5,400 ft. The highest parts of the range are in the N. and S.; in the central portion, especially between Perm and Ekaterinburg, or between Ufa and Chelyabinsk, where the two railways (Siberian and Kotlas-Tiumen) cross the mountains, the Urals have an average height of only about 1,000 ft. The mining wealth is principally found in the central and southern sections; iron, gold, platinum, copper, manganese, nickel, salt, sulphur, malachite, lapis lazuli, and gems (especially emeralds, amethysts, beryls) are the most notable items. Considerable deposits of coal exist. The forests of the Urals are enormous.

Uralsk. (1.) Province, Russian Central Asia, with Lake Aral to S.E., and the Caspian Sea and the Transcaspian province to S. and S.W. Area, 137,679 sq. m. The surface, except in the N., is a sandy plain, sloping towards the S.W. and the Caspian; in the N. it is hilly, fairly well wooded, and possesses some very fertile soil (black earth). The Ural or Yaik is the principal river. Fisheries are very important. Of the population, one-fifth are Cossacks and about four-fifths Kirghiz: the latter are Mohammedans; the former, pretty evenly divided between Orthodox and Old Believers. Pop. (1897) 646,899. (2.) Town, Russian Central Asia, in the general government of the Steppes, capital of

Uralsk prov., 160 m. W.S.W. of Orenburg, on Ural R. It has two cathedrals (one Orthodox, founded in 1837; the other belonging to the Old Believers, founded at the beginning of the 18th century), and tanneries, distilleries, breweries, brick works; manufacture of candles, soap, glue, sheepskin coats; and fisheries.

Uran, tn., Thana dist., Bombay Presidency, India, Karanja island, 9 m. S.E. of Bombay; has distilleries. Pop. (1901) 12,237.

Urania, in Greek mythology. (1.) The muse of astronomy. (2.) A surname of Aphrodite (Venus), as personifying the passion of love in its nobler aspect.

Uraniborg. See HVEN.

Uranium, U, 238.5, a metallic element occurring principally in pitchblende, which consists chiefly of uranous uranate, $U(VO_4)_2$, and is found in Cornwall, Joachimsthal (Bohemia), and Colorado (U.S.A.). The element is prepared by the reduction of uranous chloride, UCl_4 , with sodium, and is a hard white metal, of specific gravity 18.7, that melts at approximately 1600° C. Uranous salts, of a greenish colour, are derived from the oxide UO_2 , which is of a somewhat basic character, and is readily oxidized. The uranic salts, which are of a lemon-yellow colour and often marked by fluorescence, are derived from the oxide UO_3 , and contain the group $=UO_2$, united with acid radicals. Thus uranic nitrate is $UO_2(NO_3)_2 \cdot 6H_2O$. Uranic oxide also acts as an acid, forming uranates of the alkali metals. Uranium and its compounds emit rays, which have a photographic action, discharge electrosopes, and render phosphorescent substances luminous; but it is likely that this is not due to the uranium itself, but to some other element, such as radium, that may be mixed with it, and is possibly derived from it. Uranium itself finds its chief application in its compounds, which yield a canary-yellow fluorescent glass, a black pigment for china-painting, and reagents for photographic purposes.

Uranometria, a catalogue of stars visible to the naked eye, generally accompanied by a set of maps. Bayer's *Uranometria* (1603) enumerated and depicted the stars in sixty constellations, and was the first example of the application of the Greek alphabet to their nomenclature. Argelander's *Uranometria Nova* (1843) contains 3,256 stars rising above the horizon of Bonn; Heis published in 1872 a similar work, including 5,421 stars; Houzeau recorded 5,719 in his *Uranométrie Générale* (1878), constructed at Jamaica; Gould enumerated in his *Uranometria Argentina* (1879)

10,649 stars observed at Cordoba. Pritchard's *Uranometria Nova Oxoniensis* (1885) gave the photometric magnitudes of 2,784 stars.

Uranus, the seventh planet in order of distance from the sun, discovered by Herschel on March 13, 1781. It revolves at a mean distance from the sun of 1,782 million miles in a period of eighty-four years, in an ellipse of eccentricity 0.046, making an angle of $46'$ with the plane of the ecliptic. Uranus is discernible to the naked eye as a sixth-magnitude star. The Uranian globe has a mean diameter of approximately 30,000 m., and its rotation period is roughly estimated at ten hours. Its mass is $14\frac{1}{2}$ times, its mean density about 0.27, that of the earth; and gravity, at its surface, has nearly its terrestrial value. Uranus has four satellites—Ariel and Umbriel, discovered by Lassell in 1851; Titania and Oberon, by Herschel in 1787.



Earth and Uranus (U) compared.

Uranus, in ancient Greek mythology, the most ancient of the gods and their first ruler. He was the son of Gæa (earth), but is also called her husband; their children were Cronus and the other Titans, the Cyclopes, and the hundred-handed monsters Cottus, Briareus, and Gyges. Uranus hated his children, and cast them into Tartarus; headed by Cronus, they rose against him, castrated him, and overthrew his rule. From the drops of his blood sprang the Giants; and from the foam cast up in the sea by his members, Aphrodite.

Uvari. See CURARE.

Ura-tiube, tn., prov. Syr Daria, Russian Central Asia, 39 m. S.S.W. of Khojent city. It has a citadel, forty Mohammedan colleges and schools, and manufactures of goats'-hair shawls, cotton and cotton stuffs, oil, boots and shoes, and cloth. Is one of the most ancient cities of Central Asia. Pop. (1897) 22,088.

Urban. Eight popes adopted this name. URBAN II. (1088-99), born near Chatillon-sur-Marne, was successively archdeacon of Auxerre and bishop of Ostia. His election to the papal chair was contested by Guibert of Ravenna (Clement III.), the imperial candidate. He successfully prosecuted the struggle of the papacy against Henry IV. of Germany,

and in 1094 excommunicated Philip I. of France. He presided over the Council of Clermont in 1095 which gave the impulse to the crusades. **URBAN VIII.** was elected in 1623, at the age of fifty-five. He had a formidable antagonist in Richelieu, with whom, however, he finally entered into an alliance against Austria and Spain. He was a patron of poets, and was himself an author. He took himself seriously as a temporal prince, and aimed at making the position of the Church impregnable. See *Urban VIII.*, by W. N. Welch (1905).

Urbana, city, Ohio, U.S.A., co. seat of Champaign co., 41 m. W.N.W. of Columbus. It has a university (1850). Pop. (1900) 6,808.

Urban District Council. See LOCAL GOVERNMENT.

Urbanists. See CLARE, ST.

Urban Sanitary Authority. See LOCAL GOVERNMENT AND PUBLIC HEALTH AUTHORITIES.

Urbi et Orbi (*Lat.* 'To the city and to the world')—i.e. to Rome and the whole of mankind whom it may concern; a formula in use when a papal bull is published, signifying its universal authority.

Urbino (anc. *Urbinum Hortense*), anc. tn. in prov. Pesaro e Urbino, the Marches, Italy, is situated on a hill between the Foglia and the Metauro, 23 m. S. of Rimini. Silk, majolica ware, bricks, and olive oil are manufactured. Raphael was a native. The fine ducal palace, Early Renaissance style, is used as a picture gallery, and contains a *Resurrection* by Titian. The university, founded in 1564, is attended by 160 students. Urbino was a famous centre of art and literature during the 15th and 16th centuries. It is an archiepiscopal see. Pop. (1901) 18,244.

Urd. See INDIA.

Ure, ANDREW (1778-1857), Scottish chemist, born in Glasgow. In 1804 he was appointed professor of natural philosophy and chemistry at Anderson College, Glasgow, and in 1809 helped to found the Glasgow observatory. He inaugurated popular scientific lectures. From 1834 till his death he acted as unofficial analyst to the Board of Customs in London. His best known works are *A Dictionary of Chemistry* (1821), *New System of Geology* (1829), and *A Dictionary of Arts, Manufactures, and Mines* (7th ed. 1875-8).

Urea, carbamide, $\text{CO}(\text{NH}_2)_2$, is a product of the metabolism of the animal organism, and is excreted in the urine, in the case of man to the extent of about thirty grams per day. It may be prepared from urine by evaporation and conversion into the somewhat insoluble oxalate or

nitrate, from which, after purification by recrystallization, the urea can be set free by heating the solution with calcium carbonate. It is obtained synthetically by heating ammonium cyanate, and is a colourless crystalline solid resembling potassium nitrate. It is easily soluble in water, forms salts with acids, and is decomposed by sodium hypobromite, nitrogen being set free. It may be estimated by measuring the volume of nitrogen thus evolved, or by titrating with mercuric nitrate solution, with which it forms an insoluble precipitate. Urea was first isolated in 1773 by Rouelle. Its synthesis or artificial manufacture by Wöhler in 1828 was the first instance of the laboratory production of an undoubtedly organic substance.

Uredinea. See RUST FUNGI.

Urethra, the membranous tube through which the urine is expelled from the bladder. In the female it is comparatively short and wide. In the male the channel is sinuous, and being narrow, is more apt to be obstructed by calculi and by inflammatory affections, such as gonorrhoea.

Urfé, HONORÉ D' (1567-1624), French author and writer of romances, was born at Marseilles. He distinguished himself during the wars of the League, and proved his capacity as a diplomatist in France's dealings with Venice and Savoy. He is, however, best known as the author of the romance *Astrée*.

Urga, tn., N. Mongolia, cap. of northern (Mongolian) Buddhism, between Kiakhia and Peking, on an affluent of the Orkhon, in 47° 55' N. lat., and 107° E. long. It consists of two parts—the Mongol quarter and the Chinese, the former being chiefly ecclesiastical, the latter commercial. In the former is the residence of the Kutukta Lama, chief of the Mongolian Buddhists; here also are many temples, especially a famous Maidari shrine, to which over 100,000 pilgrims come yearly. The triennial (September) fair is attended by over 200,000 traders. It became a centre of Mongol Buddhism early in the 17th century. Pop. 30,000.

Urgenj, **URGANJ**, **URGHEJ**, tn., Khiva khanate, Russian Central Asia, 17 m. N.E. of Khiva city. Pop. 30,000. Old Urgenj, the ancient capital of 'Khorazmia,' or 'Kharezm,' and one of the chief cities of Asia in the middle ages, has long been deserted.

Uri, Swiss canton, running south from Lake of Lucerne; its people are German-speaking and Roman Catholics. It was one of the three original cantons of

1291, and is the legendary cradle of Swiss liberty (William Tell). It comprises the upper valley of the Reuss, and is traversed by the St. Gothard railway. Its capital is Atdorf. Area, 415 sq. m.; pop. (1900) 19,732.

Urial, or **OORIAL** (*Ovis Vignei*), the wild sheep of Asia, occurs from the Punjab through Afghanistan and Baluchistan to E. Persia. The form known as the sha, probably only a variety, extends through Kashmir to N. Tibet. The rams have a characteristic ruff of long hair on the throat. The horns of the ram curve round in a circle, while those of the ewes are very short and nearly straight. The urial will interbreed freely with domestic sheep.

Uric Acid, $\text{C}_5\text{H}_4\text{N}_2\text{O}_3$, is a complex compound produced in the metabolism of nitrogenous bodies, and excreted by the kidneys. The excrement of birds (guano) and reptiles consists largely of uric acid, and though the urine of man only contains a small percentage ('5 gram per day) when in a normal state, the proportion may be largely increased in certain pathological conditions. Uric acid can be prepared synthetically, but is most conveniently obtained from serpents' excrement by boiling with caustic potash solution, and precipitating the filtered liquid with a dilute acid. It is a tasteless white powder that is with difficulty soluble in water, and it can be identified by evaporating with nitric acid and moistening with ammonia, when a purple colour is produced. Uric acid forms a series of salts; those of sodium, potassium, or ammonium are rather insoluble in water, and are often deposited from the urine. Lithium urate is much more soluble; hence lithium compounds are employed in the treatment of gout, etc.

Uriconium. See WROXETER.

Urim and Thummim, two objects used in the older Hebrew worship, and connected with the ephod. The probable method of their use was that a question was put in such a form as to require 'yes' or 'no' for an answer, and that the priest concluded the answer of the oracle according as Urim or Thummim was drawn. Their use ceased when a higher view of the nature of God made such means of learning His will impossible. Hence in the post-exilic period they were wanting to the high priest (Ezra 2:63).

Urinary Calculus. Urinary calculi may be renal—i.e. situated in the kidney; or vesical—i.e. situated in the bladder. A renal calculus may give rise to little or no trouble, until it becomes impacted in the ureter, when it causes renal colic of an agonizing

character. In the bladder a stone may attain considerable size without giving rise to much inconvenience; but on the other hand, comparatively small calculi may occasion intense distress. The causes of calculus formation are imperfectly known. Peculiarities of constitution, race, and diet seem sometimes to be factors in the etiology. The chief constituents of calculi are uric acid, urates, phosphates, and oxalates, and more rarely cystin and xanthin. Very often a stone is composed of layers of different materials. The formation of uric acid calculi is associated with gout and with a highly acid urine, poor in salines and pigment, but containing a large amount of uric acid. Calcium oxalate frequently forms a mulberry-shaped calculus of intense hardness. Phosphatic concretions are softer, and are frequently deposited around uric acid and oxalate stones. Calculi vary in size from small gritty particles to masses weighing several ounces. The great majority of renal calculi descend to the bladder, producing characteristic intense pain, which shoots downwards towards the groin with hæmaturia, sickness, and collapse during the passage through the ureter. The symptoms of vesical calculus are pain, frequency of micturition, occasional stoppage in the urinary flow, and the presence of various morbid constituents in the urine itself. The pain often radiates from the bladder to the back and loins and to the end of the penis. It is aggravated by jolting movements, such as riding or jumping, and is most severe at the termination of or immediately after micturition. In many cases a calculus sets up inflammation of the bladder. Blood and pus may also appear in the urine, and the patient may suffer from constant straining or tenesmus, and from general irritation and distress about the genito-urinary organs. The physical diagnosis of vesical calculus is generally easily established by means of a metal sound, which, introduced by the urethra, produces a tolerably loud click on touching the stone. In women a vaginal examination renders the diagnosis of calculus comparatively easy. For the treatment of vesical calculus, see LITHOTOMY and LITHOTRITY.

Urine, or the kidney excretion, contains the chief nitrogenous waste products resulting from the body metabolism. Healthy urine is a pale, clear, straw-coloured fluid of peculiar odour, acid reaction, and a specific gravity of about 1.020. In an adult male the daily secretion amounts normally to about fifty ounces. The chief normal con-

stituents of the renal secretion are water, inorganic salts such as sodium and other chlorides, sulphates and phosphates of calcium, magnesium, potassium, and sodium, and nitrogenous crystalline substances, of which the principal are urea and its chemical ally uric acid. The normal acidity of urine is due to the presence of acid sodium phosphate, but after a meal the urine may be neutral or alkaline from the presence of the disodic phosphate in addition to the acid salt. This often produces a deposit of white phosphates, which renders the urine opaque, and sometimes gives rise to needless alarm.

Persistent increase in the quantity excreted (or polyuria) may be due to diabetes mellitus, to diabetes insipidus, or to chronic Bright's disease. Temporary increase of the quantity of urine excreted occurs after exposure to cold, nervous excitement, hysterical fits, copious drinking, and the administration of diuretics. Decrease in the quantity of urine may follow exposure to heat, acute inflammations of the kidney, exacerbations of subacute inflammations, and obstructions of the urinary passages. Urates of sodium, potassium, and ammonium are precipitated in highly acid or concentrated urine, or even in healthy urine as it cools. As they carry down the urinary pigments with them they present a 'brick dust' appearance. They dissolve on heating, or on the addition of strong mineral acid. Uric acid occurs in dark brown crystalline grains, which form a 'cayenne pepper' deposit. Albuminuria can be detected by boiling a small quantity of the urine, since heat or the addition of nitric or of picric acid precipitates the albumin. The presence of sugar may be demonstrated by boiling the suspected urine with Fehling's solution, which is a preparation of tartrate of copper. Some 85 per cent. of the nitrogen excreted in the urine is contained in the urea.

Uriu, SOTOKICHI (1857), Japanese admiral, descended from the Samurai of the fief of Dais-hoji; studied at the United States Naval Academy at Annapolis, and the Royal Naval College, Greenwich. He was promoted to be a rear admiral in 1900, and subsequently became chief of the Japanese naval intelligence bureau. In the Russo-Japanese war, he did excellent service as commander of the fourth squadron, and his was one of the first victories of the war—the destruction of two Russian cruisers at Chemulpo on Feb. 9, 1904.

Urmur Tanda, tn., Hashipur dist., Punjab, India, 48 m. N.E. of Amritsar. Pop. (1901) 10,247.

Urmia. See URUMIYAH.

Urn, a rounded or angular vase of clay, glass, or marble, having a foot, variously used in antiquity as a receptacle for the ashes of the dead, a water-vessel, an electoral vase, and for other purposes. Sir Thomas Browne's *Hydriotaphia, or Urn-Burial* (1658) contains a strange collection of fragments and reflections on the subject of cinerary urns.

Urodela. See CAUDATA.

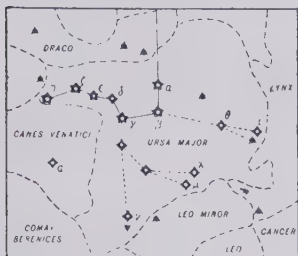
Uromastix, a genus of lizards, related to the iguana, whose members are found in Asia and Africa. The tail is covered with spiny scales.

Urquhart, DAVID (1805-77), British diplomatist, was born at Braeangwell, Cromarty, and fought in the Greek war of independence. In 1831 he accompanied Sir Stratford Canning to Constantinople, and was appointed secretary to the embassy there (1835), but in 1837 he was recalled. In 1835 his periodical *The Portfolio* appeared, but it was discontinued during Urquhart's sojourn in the East (1836-43). On his return it was revived, and continued to appear till 1845. In 1840 he published *The Crisis, or France before the Four Powers*; and, in 1844, *The Annexation of the Texas: a Case of War between England and the United States*. In 1847 Urquhart was returned M.P. for Stafford, a seat he retained till 1852. In 1855 he founded the *Free Press*, which in 1866 became the *Diplomatic Review*. Urquhart introduced the Turkish bath into England. He published *Turkey and its Resources* (1833), *The Mystery of the Danube* (1851), and *The Occupation of the Crimea* (1854).

Urquhart, or URCHARD, SIR THOMAS (1611-60), of Cromarty. In 1639 he took up arms against the Covenanters, but was defeated, and fled to England, where he was knighted in 1641 by Charles I. His *Epigrams* appeared about this time. In 1649 he joined the royal army, was captured at Worcester, and imprisoned in the Tower, but was released on parole by Cromwell in 1651. In 1652 he produced *The Jewel*, a vindication of the Scots as a nation. In 1653 he published *Logopandecteis*, a treatise on a universal language. In the same year appeared his most notable work, a translation of Rabelais. See Introduction in the Maitland Club volume of his works (1834), and in Irving's *Lives of Scottish Writers* (1839); also *Sir Thomas Urquhart of Cromarty*, by Rev. John Willcock (1899).

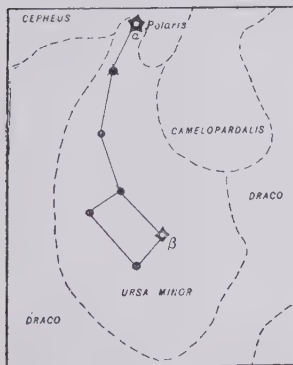
Ursa Major, an ancient constellation, circumpolar in the latitude of London. Although including originally only the seven stars of the Plough or 'Charles's

Wain,' its designation as a Bear is primitive, and was familiar to the ancient Greeks, Phœnicians, Arabs, and American Indians.



Ursa Major.

The same seven stars also figure in the East as a bier with three mourners. The two brightest stars, α and γ , are of 1.9 magnitude; α and β are designated the Pointers, because of their allineation with the pole star; α , the Bear (Arab. *Dubhe*), has an eleventh-magnitude circulating satellite. The five stars, β , γ , δ , ϵ , and ζ Ursa Majoris supply a remarkable illustration of 'star-drift,' the agreement in their movements, both radial and tangential, being so close as to compel the inference of their union into one vast system. The principal component of ζ Ursa Majoris, a visual pair revolving in sixty years, as well as ϵ , θ , ζ (see MIZAR), μ , τ , and ω , are spectroscopic binaries. 1830 Groombridge, a 6.5 magnitude star famed for its proper motion of 7" annually, lies 16" south of γ ; and the Owl planetary nebula is situated close to β Ursa Majoris.



Ursa Minor.

Ursa Minor, an ancient constellation said to have been in-

troduced by Thales from Phœnicia to the knowledge of Greek sailors about 600 B.C. Early recognized as the twin of the greater Bear, it was also called the Twister, from its constantly visible circling in the sky, and the Dog's Tail, or Cynosure, a name appropriated later to Polaris. About three thousand years ago β Ursa Minoris superseded a Draconis as pole star.

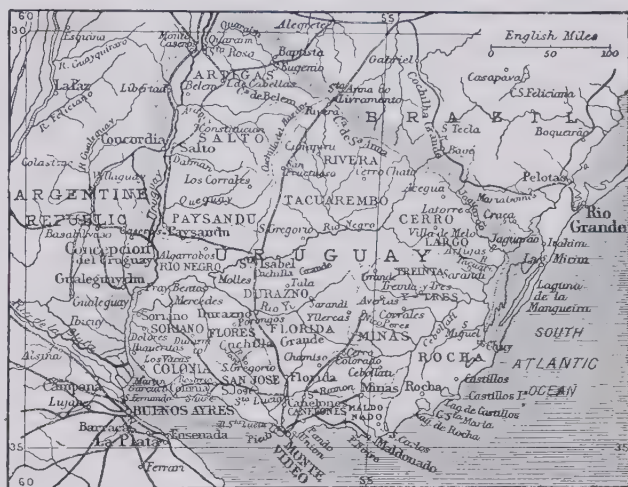
Urson, a name sometimes given to the Canadian porcupine. See PORCUPINE.

Ursula, SAINT, a reputed martyr of Cologne, the date of whose death is variously given between 238 and 451. With 11,000 attendant virgins, she was massacred by the Huns at Cologne. Excavations round that city early in the 12th century

has been a house in Edinburgh since 1836.

Urticaceæ, a natural order of plants bearing generally unisexual flowers with simple perianth, followed by hard, dry, one-seeded capsules. Among the plants which this order includes are the elm, fig, bread-fruit tree, hemp, hop, india-rubber plant, mulberry, nettle and pellitory-of-the-wall; whilst the genera include *Humulus*, *Urtica*, *Cannabis*, *Morus*, and *Ulmus*.

Urticaria, or NETTLE-RASH, is an erythematous skin affection, associated with intense burning and itching, and with the development of white patches or wheals. Urticaria may be produced by local irritation, such as contact with the stinging hairs of plants, bites of insects, or by



Uruguay.

led to the discovery of a large number of bones, with inscriptions attached, declaring them to be the remains of Ursula and her maidens, mingled with those of an unknown pope and his retinue. Ursula is regarded as the patron saint of maidens. Her day is October 21. See Schade's *Die Sage von der heiligen Ursula* (1854), and Baring Gould's *Virgin Saints and Martyrs* (1900).

Ursulines, a teaching order of nuns, founded in 1537 by St. Angela Merici of Brescia, to tend the sick and instruct the young. The order was confirmed by Paul III. in 1544. It was at Paris after 1610 that the order first came under the rules of a settled community. St. Francis de Sales promoted its extension in 1635, and planted them in Savoy. They are now widely spread throughout the world. There

the ingestion of certain drugs and articles of food. Copaiba, cubeba, turpentine, and shell-fish are notorious in this respect, and dyspepsia and uterine irritation are also associated with urticaria. It usually disappears in a few hours, but it may continue sufficiently long to interfere with sleep. Should an idiosyncrasy towards a drug or an article of diet be manifested, the patient must avoid the noxious substance, and in many such cases a tonic aperient is useful. Locally, lime water with oxide of zinc relieves the irritation, and in more obstinate cases hot baths and hot lotions are useful.

Uruguay, a republic of S. America, formerly known as Banda Oriental, and lying between the Atlantic and the river Uruguay. The country is undulating, Cuchilla de Santa Ana (1,600 ft.), Cuchilla Grande (1,500

ft.), and Acagua (2,040 ft.) being the chief elevations. The largest rivers are tributaries of the Uruguay—the Rio Negro, 350 m. long, and navigable for small vessels for about 35 m.; the Cuareim; and the Arapey. The climate is temperate, the annual mean of the thermometer being 61° F., while the extremes are 97° and 5° F. The rainfall is 35 in. annually. The undulating lands are covered with rich grass, excellent for cattle. The forests were formerly extensive. The eucalyptus and other trees have been introduced. Originally occupied by the Spanish, the country received in 1726 a large number of immigrants from the Canary Is. The intermarriage of the early settlers with the natives produced the Gaucho, who is now disappearing as a distinct type. Several European colonies have been founded—Italians, Swiss, Germans, and Spaniards. Cattle-grazing and the preparation of animal products are the most important occupations. The soil is fertile, and wheat, maize, barley, linseed, and other crops are raised. The wine is consumed locally. Gold is worked, and lead, copper, and marble are obtained. The value of the exports, most of which pass through the port of Montevideo, is about £7,000,000, and of the imports £5,000,000, annually. The government is a republic, and its head is a president elected for four years. The Senate consists of as many members as there are departments, and is indirectly chosen by the people through the medium of an electoral college, while the sixty-nine members of the Chamber of Deputies are chosen directly by the people. Roman Catholicism is the state religion, but all other creeds are tolerated. Education is well provided for, and primary education is compulsory. At Montevideo there are a university and other educational institutions. There is a regular army of about 5,000 men, and a national guard about 40,000 strong. The Banda Oriental was long disputed between the Spaniards and the Portuguese. In 1811 it threw off the Spanish yoke, but was soon after conquered by the Portuguese, and was subject to the Brazilian crown until 1828. Area, 72,210 sq. m. Pop. (1902) 978,000.

See *Uruguay* (Bureau of American Republics, 1892), Mulhall's *Handbook of the River Plate* (1832), *The Republic of Uruguay* (prepared for the Paris Exhibition, 1889), Keane's *Central and South America* (1901), *The Oriental Republic of Uruguay* (prepared for the Chicago Exhibition, 1893).

Uruguay, river. See PARANÁ.

Uruguayana, tn., prov. Rio Grande do Sul, Brazil, on the Uruguay R., and on the railway, 112 m. long, running along the river from Itaqui to Quarahy. It has a considerable trade. Pop. 10,000.

Urumiyah, more correctly URMIA, tn., prov. Azerbaijan, Persia, 12 m. w. of Lake Urmia; exports raisins and molasses. It is a summer resort of the Persian nobility, and the see of a Nestorian bishop. It is supposed to have been a chief centre of Zoroastrianism. Pop. est. at 100,000, chiefly Mohammedans, Nestorians, Jews, and Armenians. The Lake of Urmia (alt. 4,100 ft.) has a length of 80 m. and a breadth of from 12 to 25 m. It has no visible outlet, but is subject to periodical expansions of area (1,800 sq. m. in 1898). It is shallow (maximum depth 50 ft.), and its water too salt for fish to live in.

Urumtsi, or URUMCHI, tn., Zungaria, towards the extreme N.W. of the Chinese empire, at N. base of Tian-Shan Mts., in 43° 26' N. lat., 87° 29' E. long. Commanding the only pass practicable for artillery between Zungaria and Chinese Turkestan, it is an important strategic point. Close by is Yakub Beg's fortress. Here was the capital of the Uigur Turks in the 12th century. Pop. 20,000.



Urus, or Aurochs.

Urus (*Bos taurus*), the ancient wild ox of Europe, the ancestor of the existing domesticated forms, is probably still represented by the semi-wild forms preserved in parks in various parts of Great Britain, as at Chillingham. See AUROCHS.

U.S., United States; United Service.

U.S.A., United States of America, United States army.

Usbegs. See UZBEGS.

Usedom, isl., Pomerania, Prussia, at mouth of Oder, with the neighbouring island of Wollin, separates the Stettiner Haff from the Baltic. It covers an area of 158 sq. m.; its chief industries are agriculture, forestry, and fishing. It is also a summer resort. The town of the same name is on the s.w., 14 m. w.s.w. of Swinemünde, the chief town. Pop. (1900) 35,000.

Usertesen, three kings of Egypt of the twelfth dynasty (2778-2565 B.C.). USERTESEN I.

was the son of the founder of the dynasty, Amenemhat I. He conquered a number of the races of Kush, acquiring also new territory in Nubia and Sinai. He is believed by some to be the Pharaoh of Joseph. USERTESEN II., identified by Manetho as Sesostris, succeeded, and under his rule the empire was at the height of its prosperity. But an even greater monarch was USERTESEN III., who was honoured with divine worship and sacrifices. He fought against the negroes of Kush, and the remains of the sanctuaries and fortresses which he built at the second cataract still exist. He completely subdued the Nubians; and from Syene to beyond the second cataract, the Nile valley, and the country on both sides of the river, became part of the Egyptian empire. See Brugsch's *Egypt under the Pharaohs*, vol. i. (1879), and Petrie's *History of Egypt*, vol. i. (5th ed. 1903).

Uses. Under the old law of England, before the Statute of Uses (27 Henry VIII. c. 10), uses were equitable trusts of land and other corporeal hereditaments invented by conveyancers for the purpose, generally, of evading the common law. Legal conveyances of land by feoffment, fines and recoveries, or lease and release, either publicly changed the possession of the land, or enlarged the estate of one already in possession. The owner of the land was known, and all the burdensome incidents of feudal tenure, such as wardships, reliefs, marriages, and escheats could be enforced. If a man sold land and received the price and then refused to convey, the purchaser could not enforce the bargain in the common law courts, but could only sue him for damages. But the Court of Chancery gave equitable relief in such a case. It could not transfer the legal estate in the land to the purchaser, but it declared that the legal owner was seised to the use of, or we should now say in trust for, the purchaser, and it put him in possession and gave him a title to the profits. This doctrine of the Court of Chancery was taken advantage of by conveyancers to escape from the incidents of feudal tenure above referred to. Lands were conveyed to feoffees to uses, or trustees, as joint tenants, who held the legal estate in the land, while the profits went to the persons for whose use they held. If one of the feoffees died the others took by survivorship, and the burdens arising on death were evaded, while the person who had the use could convey secretly by will or deed.

The Statute of Uses declared that when any one is seised of

lands to the use of any one else, the person who has the use shall be deemed to have the lawful seisin. But the ingenuity of lawyers soon evaded the statute by the creation of trusts. The courts held that there could not be a use upon a use, so that if a grant was made to A and his heirs to the use of B and his heirs to the use of (or upon trust for) C and his heirs, the legal estate passed to B by virtue of the statute, but that the statute could carry it no further, and therefore B held the lands in trust for C, who was entitled to the use. See Bacon's *Reading on the Statute of Uses* (in *Works by Spedding*, vol. vii.).

Ushant (Île d'Ouessant), fortified rocky isl., dep. Finistère, W. France, 27 m. W.N.W. of Brest. Fishing is the chief industry. Pop. (1901) 2,717.

Ushaw, BATTLES OFF CAPE. (1.) On July 27, 1778, the British, under Admiral Augustus Keppel, met a French fleet under Comte d'Orville; the result was indecisive. (2.) The battle commonly known as that of 'the Glorious First of June,' 1794, was fought between Admiral Lord Howe and a French fleet under Admiral Villaret-Joyeuse. At the close Howe had six prizes left in his possession.

Ushaw, vil., Durham, England, 5½ m. W. of Durham; seat of St. Cuthbert's (Roman Catholic) College, transferred from Douay.

Ushküb. See SKOPLJE.

Usk, THOMAS (d. 1388), born in London, author of *The Testament of Love*, until 1844 regarded as the work of Chaucer. In 1387 the rebellion of the Duke of Gloucester drove Richard II. to the impeachment of his chief counsellors; Usk shared in their downfall, and was executed. While in prison he wrote *The Testament of Love*, included in Skeat's *Chaucerian and Other Pieces* (1897).

U.S.N., United States Navy.

Usnea, a genus of gymnocarpous parmeliaceous lichens, with subterminal peltate apothecia, usually of a gray colour, found hanging on trees, and popularly known as tree-mosses or beard-mosses. See LICHENS.

Uspallata, two passes in Andes of S. America—the Paso de la Iglesia (12,500 ft.), and the Paso Vernejo, more to the S., about 520 ft. higher. The Argentine-Chilean railway, with a toothed rail in some sections, runs from Mendoza to Las Cuevas in the valley of the Cuevas, 10,430 ft. above sea-level, where a tunnel (7 m.) under the summit is to connect with Tambillos. Thence the line is to be continued to Salto del Soldado, which is already connected with the Chilean system at Santa Rosa. The total length

of the railway will be 150 m., but there is no immediate prospect of its completion.

U.S.S., United States Ship.
Ussher, JAMES (1581-1656), Irish divine, born in Dublin. About 1605 he was preferred to the chancellorship of St. Patrick's, Dublin, while in 1607 he was appointed professor of divinity at Dublin. In 1621 he was nominated bishop of Meath and Clonmacnoise, and in 1625 became archbishop of Armagh. He went to England in 1640, and took part in the ecclesiastical questions raised in the Long Parliament. After the execution of Charles I., though a well-known royalist, Ussher was indulgently treated by Cromwell, who gave him a public burial in Westminster Abbey. His writings include

proposed to petition the king absolutely and irrevocably to unite the duchies to Denmark. In 1848 he was made procurator-general of Denmark. He wrote *Haandbog i den Danske Criminalret* (1859), *Haandbog i den Danske Arveret* (1855).

Ussuri, riv. in Maritime Province, E. Siberia, rises in the Sikhotaalin Mts., and flows N.N.E. into the Amur at Khabarovsk. Length, 480 m., of which over 300 m. are navigable.

Ustilagineæ. See SMUT.

Ustyug-Velikii, tn., Vologda govt., N. Russia, 245 m. E.N.E. of Vologda town; is an episcopal see, and has two famous annual fairs, sawmills, and breweries, manufactures of woollen and linen cloth, hosiery, ironmongery, soap, candles, and articles in gold and



Utah.

Britannicarum Ecclesiarum Antiquitates (1639) and *The Annals of the World* (1658). He it was who first attempted to formulate a Biblical chronology. See Elrington's *Life* (1848) and W. Ball Wright's *Ussher Memoirs* (1889).

Ussing, JOHAN LUDWIG (1820-1905), Danish antiquary; professor of classical philology and archaeology at Copenhagen (1849-95); wrote *Inscriptiones græcæ ineditæ* (1847); *Griechische Reisen und Studien* (1857); *Erziehung und Unterricht bei den Griechen und Römern* (1885); *Græske og Romerske Metrik* (1893); and *Pergamos, dens Historie og Monumenter* (1897).

Ussing, TAGE ALGREEN (1797-1872), Danish statesman, born at Lille Lyngby in Zealand; came forward in 1830 as a radical politician, and was made (1841) an assessor of the High Court. At the Roskilde meeting of 1844 he

silver. Terrible inundations occurred in 1516 and 1762. Pop. (1897) 11,309.

Usufruct, a term of Roman law signifying the right to reap the fruits or take the benefit of things belonging to others. It might exist in land, houses, slaves, or anything that is not consumed by use. A usufructuary of land was in the same position as a tenant for life in England, with the addition that he had the right to open new mines and quarries.

Usury. A reward to the lender for the use of his money by the borrower. The term is usually confined to exorbitant or illegal rates of interest. In 1854, by 17 and 18 Vict. c. 90, all laws against usury were repealed, and the only case of a legal rate of interest is that authorized in the case of pawnbrokers. The 109th canon of 1603 includes 'usury'

among the notorious crimes and scandals which are to be certified into ecclesiastical courts by presentment, and sect. 12 of the Clergy Discipline Act, 1892, enacts that 'the expressions immoral act, immoral conduct, and immoral habit, shall include such acts, conduct and habits, as are proscribed by . . . the 109th canon.' By the Money Lenders Act, 1900, the court has power to give relief in case of unconscionable bargains by money lenders.

Utah. (1.) One of the western states of the United States of America, with an area of 82,190 sq. m. It was organized as a territory in 1850, and admitted as a state in 1896. The Wasatch Mts., one of the many ranges of the Rocky Mountain system, stretch southward down the middle of the state, separating a region of plateaus drained by the Colorado R. on the E. from the Great Basin on the W. The former is characterized by level or slightly inclined table-lands, bordered by cliffs and deeply gashed by cañons. The Great Basin is a succession of broad desert valleys, alternating with abrupt linear mountain ranges, and without drainage to the sea, the scanty rain which falls upon its surface being absorbed by the thirsty soil, or licked up by the dry atmosphere. In this region is the basin of Great Salt Lake, into which flow the waters from the Wasatch range. The rainfall is everywhere less than is needed for agriculture, and irrigation is resorted to. There is no timber, except upon the higher mountains. The capital and chief city is Salt Lake City. Farming is of great importance, but is second to mining. The pastoral industry also is of considerable importance. The principal mineral products are the precious metals, copper, and lead. Pop. (1900) 276,749, of whom 51.2 per cent. were males, and 48.8 per cent. females. About two-thirds were Mormons. Foreign-born numbered 53,777, or 19.4 per cent. (2.) A lake of central Utah, U.S.A., into which flow Provo R., Spanish Fork, and other streams from the Wasatch range, and which is drained N. to Great Salt Lake by the Jordan R.

Utakamand, or OOTACAMUND, munic. tn. and cap. of Nilgiri Hills dist., Madras Presidency, India, picturesquely situated on a plateau surrounded by hills. It has an artificial lake nearly 1½ m. long. Utakamand is the summer headquarters of the government of Madras, and is the chief sanatorium of that presidency. The Lawrence Asylum for military orphans, botanical gardens, the government cinchona plantations, Hobart park and

recreation grounds, are its chief features. Alt. 7,228 ft. above sea-level. Pop. (1901) 18,596.

Uterus is a dilatation in the walls of the oviduct. Such dilatations are present in insects and worms. In birds, although the ova are developed externally, the term uterus is often applied to the cavity in which the eggs receive the shell. In most viviparous fishes and in some reptiles the ova develop within the uterine cavity, but while there receive no nutriment from the mother. In the monotremes, according to some, there is no distinct uterus, the oviducts opening directly into the cloaca. Gegenbaur, however, calls the lower end of each oviduct a uterus. In marsupials each oviduct is differentiated into a Fallopian and a uterine portion, and in higher mammals the uterus is variously modified. In some edentates and most rodents each oviduct passes into an intestiform uterus. The two uteri are divided in the middle line, but this double uterus opens by two orifices into the single vagina. In ruminants and whales the uterus is single, but its upper end is partially divided into two horns. In the primates the uterus is normally single.

In the human female the uterus or womb is the organ of gestation, receiving and retaining the fertilized ovum during the development of the fœtus, which it expels by muscular contraction at the time of parturition. Uterine structures also transmit nourishment to the fœtus and remove certain waste products of intra-uterine life. The uterus is situated in the pelvic cavity between the bladder and the rectum, being supported laterally by the round and the broad ligaments. The cavity of the uterus is small in comparison with the size of the organ. It is triangular in shape, the base being towards the fundus. At each superior angle is a funnel-shaped space, at the bottom of which is the minute orifice of the Fallopian tube. Through this orifice the ovum reaches the interior of the uterus. At the inferior angle of the uterine cavity is another small opening, which leads to the cervical cavity.

Many of the pathological conditions affecting the uterus and its appendages depend upon the periodicity of activity manifested in the menstrual cycles, many are associated with the changes due to pregnancy, and not a few are consequent upon tight-lacing and want of exercise. The more common morbid conditions are malformations, inflammations, displacements, malignant disease, tumours, and lesions due to accidents or abnormalities

of pregnancy and labour. Inflammatory mischief may arise from such various causes as a chill during a menstrual period, subinvolution after pregnancy or abortion, and venereal diseases. Uterine inflammations are frequently associated with sterility, and when inflammatory products are thrown out around the uterus displacement of the organ is often the result. Displacement may occur downwards from weakness of the pelvic floor, and sometimes the whole uterus slips down and becomes external. In such cases there is generally enlargement of the organ, associated with old-standing damage to the perineum. Medullary carcinomata and epithelial cancers are the most common types of malignant disease, and they generally originate in or about the cervix, affecting chiefly women about the menopause. Tumours of the uterus, apart from malignant disease, are chiefly fibroid in character. They are extremely common, occurring, according to some authorities, in sixty per cent. of women who die over middle age. In many cases they give rise to no trouble. In others their size causes distress from pressure upon neighbouring structures, while sometimes they lead to severe and even dangerous hæmorrhage. Lesions due to pregnancy and labour are numerous, and have often important influence on the after health of the patient, contributing to inflammatory conditions and to displacements. An extremely common source of uterine disease is subinvolution, which is a failure of the uterus to return to its normal non-pregnant size and condition after the completion of labour.

The treatment of uterine disease is chiefly surgical. Uterine health might in many cases be maintained, and uterine disease might often be much more easily cured, were women imbued with the importance to themselves and to their progeny of keeping their physical condition at the highest possible level by means of open air exercise, plain food, sensible dress, and regular habits.

Utes, or UTAHS, N. American Indians, a chief branch of the Shoshonean division, formerly scattered over Colorado, New Mexico, California, Nevada, and Utah. In 1900 they numbered collectively about 2,500, the majority distributed in Nevada, Colorado, and Utah. Most of the 'cliff dwellers' of the Colorado cañons belong to this connection, and show affinities in type and culture with the Hopi Pueblos of Arizona.

Uther Pendragon. See ARTHUR.

Utica. (1.) City, New York, U.S.A., co. seat of Oneida co., on

the Mohawk R. and Erie Canal, 50 m. E. of Syracuse; manufactures cotton goods, hosiery, and knitted goods, clothing, boots and shoes, and machinery and foundry products. Pop. (1900) 56,383. (2.) Phœnician colony, founded about 1100 B.C. by Tyre, on the N. coast of Africa, in the district anciently called Zengitana, now Tunis. After the destruction of Carthage in 146 B.C., it became the chief town of the Roman province of Africa, but was destroyed by the Saracens. It was the scene of the suicide of the younger Cato.

Utilitarianism, the term brought into general use by J. S. Mill to describe the ethical and

could be measured and determined. Politically, the application of this standard meant a great advance in the direction of liberty and equality. And the period was marked by much reforming legislation. (See Dicey's *Law and Opinion in England*, 1905, Lect. 6.) Ethically, Bentham regarded the action of the individual as determined solely by motives of self-interest or pleasure, and relied on the pressure of law and public opinion to bring the actions of individuals into conformity with the end of greatest general happiness, though he seems also to have held that such conformity best promoted

trine. By Sidgwick this was sought in a combination of the utilitarian criterion of value with principles of duty derived from intuitionism, and required, in his view, to explain the claim of the general happiness upon the individual—a point which the older utilitarianism had never satisfactorily dealt with. By others—e.g. Herbert Spencer—recourse was had to conceptions and principles derived from the biological theory of evolution. See Sidgwick's *Hist. of Ethics* (3rd ed. 1892), Albee's *Hist. of English Utilitarianism* (1902), and Leslie Stephen's *English Utilitarians* (3 vols. 1900).



Utrecht: La Grande Place (Steenweg).

political theory which makes 'the greatest happiness of the greatest number' the supreme end or criterion of conduct. The other chief representative of utilitarianism proper is Bentham, in his *Principles of Morals and Legislation*. The principle of greatest happiness had indeed been held by previous moralists, and had by Paley in particular been made the leading principle of his theologically sanctioned ethical system. The chief value of the principle in Bentham's hands was that it supplied an apparently very definite legislative ideal and standard by reference to which the advantages and disadvantages of particular laws

the individual's own happiness. Moreover, in his method of determining the greatest happiness he recognized no intrinsic superiority in one kind of pleasure over another. Mill, in his *Utilitarianism*, sought—not always very consistently—to infuse a more generous spirit into the doctrines of the school. He recognized the intrinsic worth of the higher pleasures, and pointed to the superiority of the internal sentiments of sympathy and duty over external sanctions in securing the conformity of the individual's actions with the general happiness. One result of Mill's teaching was the necessity of a new basis for utilitarian doc-

Utopia, Sir Thomas More's ideal island, the site of his romance *De Optimo Reipublice Statu, deque Nova Insula Utopia*, published in Latin in 1516 and translated into English in 1551; ed. by J. C. Collins (1904). Bishop Burnet's translation (1683) is the best known. The term Utopian is now applied to impossibly ideal schemes.

Utraquists, a controversial name applied to those who maintain that the holy eucharist should be received *sub utraque specie* by the laity. But the name is specially applied to the Calixtines, a sect of the Bohemian followers of Huss in the 15th century, so called as partaking of both elements. They were reconciled to the

Church of Rome at the Council of Basel (1433). See HUSSITES.

Utrecht. (1.) The smallest province of the Netherlands, lies s. of the Zuider Zee. Several of the arms of the Rhine delta cross it. It is low and fertile in the w. and along the rivers, but becomes higher, sandy, and infertile in the e. Cap. Utrecht. Area, 534 sq. m. Pop. (1900) 251,034. (2.) Town, Netherlands, cap. of above prov., 22 m. by rail s.e. of Amsterdam, and on Crooked Rhine. The headquarters (since 1723) of the Jansenist or Old Catholic religious party in Holland, and the seat of their archbishop, Utrecht has a fragment of a cathedral, for the nave was blown down during a storm in 1674; the first church on the site was built in 720 by St. Willibrord, apostle of the Frisians. There is also an archiepiscopal museum, with Dutch paintings of the 15th to the 17th centuries. For the university, founded in 1636, and attended by about 850 students, new buildings were erected in 1894. Textiles, machinery, chemicals, tobacco, bricks, and beer are the chief objects of industry. By the Frisians and the Franks it was called Wiltaburg. Here was formed in 1579 the union of the seven Protestant provinces—the union out of which grew the nation of the Netherlands; and here in 1713 was signed the treaty of peace which ended the war of the Spanish Succession. Pope Adrian VI. was born at Utrecht in 1459. Pop. (1900) 102,086.

Utrecht, vil., Natal, British S. Africa, in a fruit-growing country, 30 m. E.N.E. of Newcastle; has deposits of coal. The district of Utrecht, formerly in the Transvaal, was annexed to Natal in January 1903. Pop. (1904) 3,478.

Utrera, city, prov. Seville, Spain, 16 m. S.S.E. of Seville. Pop. (1900) 15,138.

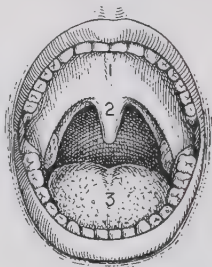
Utricularia, a genus of herbaceous plants belonging to the order Lenticulariaceæ. They bear flowers with two equal

sepals and a spurred corolla. The bladderwort is *U. vulgaris*. See BUTTERWORT.

Ut sup., *ut supra* = as above.

Uttoxeter, mkt. tn., Staffordshire, England, 15 m. N.E. by E. of Stafford; with alabaster quarries. Pop. (1901) 5,133.

Uvula, a small conical prolongation depending from the middle of the lower portion of the soft palate. It frequently participates in inflammatory conditions of the throat and fauces. When inflamed it is often swollen, oedematous, and elongated, and may give rise to laryngeal irritation, to irritable cough, and to reflex vomiting. When greatly elongated, or when it hangs abnormally low, as it often does in post-diphtheritic paralysis of the soft palate, the uvula may induce symptoms of suffocation by entering the larynx. Removal of the lower end of the uvula is often necessary in persistent elongation.



Uvula.

1. Soft palate; 2. uvula; 3. tongue.

Uvularia, a genus of hardy American bulbous plants, belonging to the order Liliaceæ. They bear in spring pale yellow, campanulate flowers, and are easily cultivated in Britain in ordinary light soil.

Uwins, THOMAS (1782–1857), English painter, was born at Pentonville, near London. He was a member of the Water-colour Society in 1813, and became sec-

retary, retiring in 1818. In Edinburgh he was known as a portrait painter. From 1831 onwards he exhibited in the Royal Academy in London. He was elected R.A. in 1838. Later he was appointed surveyor of the royal pictures. He was keeper of the National Gallery (1847–55), London, where three of his pictures are hung.

Uxbridge, tn., Middlesex, England, on Colne, 15 m. w. of London; memorable for the futile negotiations between the commissioners of King Charles and the Parliament (1645). Pop. urb. dist. (1901) 8,585.

Uxmal, ruined city, Yucatan, Mexico, 40 m. s. of Merida; has magnificent remains of Mayan structures. The finest is the 'Casa del Gobernador,' a narrow building, 322 feet in length, ornamented with a beautifully sculptured frieze.

Uzbeks, a Turki people of reputed Uigur stock, who in the 14th century migrated from Kashgaria to W. Turkestan. Vambéry regards the term Uzbek as political rather than ethnical. Some of their tribal names—e.g. Naiman and Kipchack—are used by the Kirghiz, while others occur also among the Turkomans and Karakalpaks. The confusion was increased, especially in the large towns (Khiva, Bokhara, Samarkand, Tashkend) when the conquering Uigurs came in social contact with other elements, such as the Arabs and the Sarts—that is, Tajik (Persian) traders and artisans.

Uzziah, or AZARIAH, king of Judah (c. 789–737 B.C.), was the son of Amaziah. He triumphed over Philistines, Arabs, and Ammonites, fortified Jerusalem, reorganized the army, and encouraged agriculture. Venturing to offer incense in the Holy Place, he was smitten with leprosy (2 Kings 15:27 f.; 2 Chron. 26). His long reign of fifty-two years, probably embraces a co-regency both at the beginning and at the end. He was succeeded by his son Jotham.

V. Until the 16th century, V and U were two forms of the same letter. They are now distinguished, and each has taken part of the duty performed by the undivided letter. U, for the most part, is restricted to the representation of vowels, and V is employed with a consonantal value; W also shares in the division. V in English and French is voiced *f*—i.e. the voiced lip teeth spirant. In German it has the value of *f* itself. The sound *v* is not liable to much variation. Regarding the form, see U.

V., versus = against; *vide* = see.
V.A., Order of Victoria and Albert.

Vaal, riv., S. Africa, rises in Drakenberg Mts., S.E. of Transvaal Colony, and after being joined by the Klip flows W. and S.W. between the Transvaal Colony and the Orange River Colony towards Platberg, whence it continues through Griqualand West to join the Orange R., in 29° 10' S. and 23° 50' E., after a course of 700 m. Chief tributaries—Wilge, Valsch, Zand, and Modder on the left, and Harts on the right.

Vaapens, a Negrito race of cave-dwelling cannibals, inhabiting N. Transvaal and Bechuana-land, in which latter territory they live in a state of serfdom to the Baralong. The Vaapens are even lower in the scale of humanity than their kinsfolk the Bushmen.

Vac, or **VACH**, in the *Rig-Veda*, the personification of speech; in later literature identified with Sarasvati.

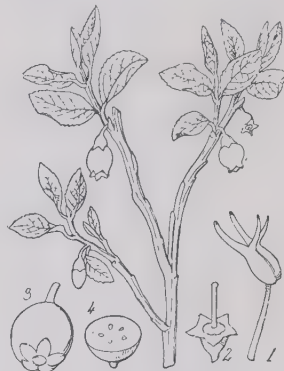
Vaccination, the operation for the prevention of smallpox, or the ensuring of it in only a mild form. It was first advocated by Jenner, who, in 1798, announced his discovery that those who by accident had become infected with cowpox—a disease whose relation to smallpox is not yet absolutely ascertained—became practically immune to smallpox. Vaccination is now performed with lymph taken from the eight-day vesicles produced by previous vaccination of a child or of a calf. Lymph from a child is called 'humanized' lymph. The lymph may be collected on bone or ivory points, and preserved by drying; or it may be taken up into thin glass tubes (capillary tubes), which are then hermetically sealed to exclude air. Often glycerin is mixed with the lymph, to aid its preservation. Vaccine is introduced into the system by pricking or scarifying the skin, most usually of the arm—lymph having previously been blown from a capillary tube on to the place

or places to be scarified. The site is practically immaterial, except that exposed parts are avoided because of the practically permanent scars which follow successful vaccination. About the eighth day the vesicle is of full size, and two or three days later the redness about the mark begins to fade, a scab forms and drops off, leaving a new skin beneath in about three weeks from vaccination. Jenner imagined that a single vaccination protected for life. It is now generally held that for permanent safety it is probable that a child vaccinated within the first six months of birth should be re-vaccinated some fifteen years later, and again any time after an interval of ten years should smallpox be prevalent. The great argument brought against vaccination is the danger of transmitting other disease, and particularly syphilis, with the lymph. That syphilis may be, and occasionally has been, transmitted in this way is true; but this merely shows the necessity of choosing absolutely healthy children from whom to take lymph. Better still, it is in favour of vaccinating with glycerinated calf-lymph, which is equally protective, and is secure from conveying syphilis. Analogous to vaccination is the protection afforded in other contagious diseases—e.g. diphtheria and typhoid fever—by the inoculation of serums (see **SERUM**), and in tuberculosis by the intestinal absorption of tubercle bacilli modified by heat.

Vaccination Acts. In 1851 vaccination was made compulsory. The statutes regulating the subject are the Vaccination Acts, 1867 to 1898. Under the Act of 1867 it is the duty of the guardians to appoint vaccination officers to enforce the act, and to enter into a contract with a qualified medical practitioner to vaccinate children gratuitously, and, if required, at the child's home, and to give certificates. Persons having the custody of a child are required to have it vaccinated within six months of birth; by the Act of 1898, which does not extend to Scotland or Ireland, if they satisfy a petty sessional court within four months of birth that they conscientiously believe that vaccination would be prejudicial to the child's health, they are to receive certificates exempting them from penalties. This act also abolished repeated penalties. Many boards of guardians have, in consequence of an anti-vaccination propaganda, neglected the statutory duties imposed upon

them; but the Local Government Board can obtain a mandamus from the High Court to compel their obedience. Vaccination in Scotland is governed by the Vaccination (Scotland) Act, 1863, and is carried out by the parish council. Vaccination must be carried out within six months, under a penalty of one pound or ten days' imprisonment. Vaccination in Ireland is governed by the Vaccination (Ireland) Acts, 1857, 1863, 1868, and 1879. In Ireland a child must be vaccinated within three months of birth. Revaccination is not compulsory anywhere in the United Kingdom, but it is compulsory in France, Germany, Italy, and Japan, and recent statistics have proved its value.

Vacciniaceæ, a natural order of shrubs and trees, bearing flowers with gamopetalous, globose, or campanulate corollas, and followed by baccate fruits. The bilberry, cranberry, and huckleberry are members of this order.



Vaccinium Myrtillus.

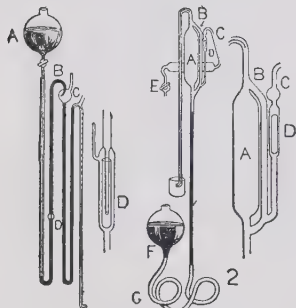
1, Stamen; 2, calyx and style; 3, fruit; 4, section.

Vaccinium, a genus of mostly hardy shrubs belonging to the order Vacciniaceæ. They bear globose berries, often edible and of economic value. Thus *V. Myrtillus* yields the bilberry, blaeberry, or whortleberry, and *V. Oxycoccus* the cranberry. Several other species are good shrubs for cultivating in gardens.

Vacherot, ETIENNE (1809-97), French philosopher, was born at Langres, and in 1839 succeeded Cousin as professor of philosophy at the Sorbonne, Paris. Deprived of his chair in 1852 on his refusal to take the oath of allegiance to the new empire, he later entered political life as a deputy (1871-76) to the Chamber. His most important writings were *Histoire*

Critique de l'Ecole d'Alexandrie, in 3 vols. (1846-51), and *La Méta-physique et la Science* (1853).

Vacquerie, AUGUSTE (1819-95), French author and journalist, born at Villequier in Normandy; became acquainted with Victor Hugo, whose devoted admirer he was. He wrote plays in the style of his master, including *Tragédies* (1848), *Souvent Homme Varié* (1859), *Les Funérailles de l'Honneur* (1861), *Jean Baudry* (1863), and *Le Fils* (1866). Among his other works are *Les Miettes de l'Histoire* (1863) and other collections of essays. See *Life*, in French, by Bertal (1888).



Vacuum Pumps.

1. Sprengel pump; A, reservoir; B, inverted siphon; C, exhausted globe; D, air traps. 2. Toepler pump; A, pump chamber; B, side tube; C, gas entering tube; D, glass valve; E, stopcock; F, reservoir of mercury; G, flexible tube.

Vacuum, a word used to describe the more or less highly attenuated gas contained in exhausted receivers. High vacua are produced in several ways, the commonest by means of the mercurial air-pump. There are two chief types of this instrument, of which the Sprengel and Toepler pumps may be taken as examples. In the Sprengel pump mercury is dropped down a tube about one metre long and two millimetres bore, with the result that the mercury breaks up into a series of pistons, which draw in the air or other gas through a branch tube connected near the top of the fall tube. In the Toepler pump a vessel is filled with mercury by raising a reservoir attached to it by a flexible tube, the air being expelled through a tube attached to the top of the vessel and bent over into a basin of mercury about a metre below. On lowering the reservoir a Torricellian vacuum is produced in the vessel, so that if it is connected to a receiver it is desired to exhaust, the air in the latter divides itself between the receiver and the vessel. On repeating the operation many times a high degree of exhaustion may be attained. The preparation of lique-

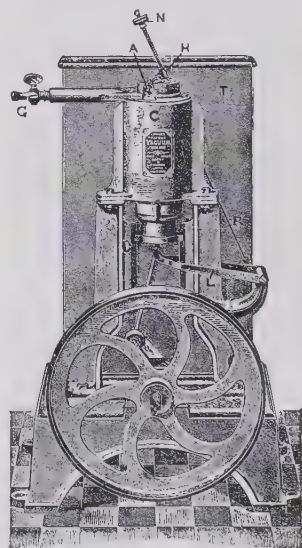
fied gases of very low boiling-point has provided a very effective means of producing high vacua. Thus, if a tube attached to the receiver to be exhausted is immersed in liquid hydrogen, almost the whole of the air or similar gas in the vessel is condensed in the cooled tube, which can then be sealed off. This method has been made much more generally useful by the discovery by Dewar that if the tube in which the gas is to be condensed is filled with dense and recently heated charcoal, surrounding it with liquid air will be sufficient to produce rapidly a very perfect vacuum in the receiver attached.

High vacua are best measured either by observing the character of the electric discharge in them or by means of the M'Leod gauge; the ordinary manometer, in which the pressure is balanced against a column of mercury, becomes useless as soon as the pressure is reduced to less than about the 1000th part of that of the atmosphere. In spark gauges, as the exhaustion proceeds the discharge is first ribbon-like, and then spreads into a luminous glow. The glow then disappears and the glass fluoresces, the discharge finally refusing to pass at the highest degree of exhaustion. In the M'Leod gauge the pressure of the highly rarefied gas in a vessel is increased by allowing mercury to flow in, and the volume of gas under the new pressure is measured in a small tube attached to the vessel; and the original pressure is calculated by applying Boyle's law. The method, however, is liable to serious error owing to condensation of the gas on the surface of the glass. See Thompson's *Development of the Mercurial Air Pump* (1888), *Jour. Soc. Arts* (1888), and Travers's *Study of Gases* (1901).

Vacuum Brake. See BRAKE.

Vacuum Engines are single-acting heat motors for small powers, the sizes varying from one-fifteenth to one-half of a horse-power. In the engine here described the top of the cylinder C, is provided with a suitably arranged upward-acting mushroom type valve. During the first half of its outstroke, the valve being then open, the piston draws a flame into the cylinder from an ordinary bunsen type burner, supplied with gas through a pipe G, and arranged so that the flame plays immediately over the valve; the valve then closes, and by the time the piston has completed its outstroke the flame has burnt itself out. The hot gases in the cylinder are then cooled by contact with the water-jacketed walls. A partial vacuum is thus formed within the cylinder,

and the pressure of the atmosphere acting on the exposed face of the piston forces it into the cylinder, and gives the engine its motive power; the engine thus receives an impulse every revolution. The circulating water for keeping the cylinder cool is contained in a tank T, mounted on the same frame as the engine. The flame-inlet valve is lifted at the proper moment by a lever attached to a rocking bar A, which is operated through a sleeve H, rod R, and radius link L—the latter receiving its motion from the end of the piston-rod. On both sides of the sleeve H there are spiral springs; the bottom one being forced against the sleeve, as the rod R rises, causes the valve to open; and in a similar manner, as the rod descends, the valve is



The Lowne Vacuum Engine.

closed. The speed of the engine can be regulated by screwing a nut N up or down the rod R; this alters the tension of the springs, and changes the opening and closing position of the valve. These engines are also designed to work with petroleum or denatured alcohol.

Vacuum Tubes. *Spark Discharges.*—When a sufficiently high potential difference is applied to two terminals, say two small brass spheres, separated by a distance of a fraction of an inch, an electrical discharge occurs, and a spark passes between the two terminals. The experiment is most conveniently performed by attaching the two terminals to the terminals of the secondary of an induction coil, which should

be also connected to the inner and outer coating of a Leyden jar respectively. When a sufficiently strong current is sent through the primary of the induction coil, a torrent of sparks will pass between the secondary terminals. Experiments which have been made on the relation between the sparking length (i.e. the distance between the terminals) and the sparking potential (i.e. the potential difference just necessary to cause a spark to pass) show that for a sparking distance of one centimetre, or two-fifths of an inch, a potential of 30,000 volts is necessary. If the sparking terminals are inserted in a vessel from which the air may be gradually exhausted by means of a vacuum pump, it is found that the sparking potential decreases directly as the pressure until very low pressures are reached. It is, however, impossible to force a discharge across an absolute vacuum.

Nature of the Discharge in Gases at Low Pressures.—As the pressure of a gas is reduced, the character of the discharge alters completely—no longer taking the form of a spark, but becoming much more complicated in character. In order to study the nature of the discharge at pressure of about $\frac{1}{10}$ that of the atmosphere, an apparatus of the form indicated in the accompanying diagram is very useful. (Fig. 1.) This consists of a glass tube closed at both ends, and provided with a side tube to enable it to be attached to a vacuum pump. The terminals, or electrodes as they are termed, consist of two small aluminium discs attached to stout pieces of platinum wire which are fused through the glass, and with which connection may be made to the terminals of an induction coil, or to those of a Wimshurst or other influence machine, which would serve equally well. When a discharge is passed through the exhausted tube by either of these means, the following phenomena are displayed. There is a thin layer of luminosity over the negative electrode, or cathode as it is called, succeeded by a well-defined region, known as the 'Crookes dark space,' in which there is no luminosity. This is succeeded by a faint glow extending some little distance, called the 'negative glow,' followed in turn by another less sharply defined dark space, known as the Faraday dark space. Lastly comes a bright glow extending right up to the anode, known as the 'positive column.' Geissler tubes are vacuum tubes of a form shown in Fig. 2, similar to the tube described above, except that they are constricted in diameter for

a length of some three inches in the middle.

Cathode Rays.—The above description applies to tubes which are exhausted until the pressure is about $\frac{1}{10}$, or as low as $\frac{1}{100}$ of an atmosphere. As the exhaustion is carried still further, the character of the discharge gradually alters, and we notice the appearance of a faint blue beam of light proceeding perpendicularly outwards from the face of the cathode, becoming more and more strongly marked as the pressure is reduced to, say, $\frac{1}{1000}$ that of the atmosphere, the other phenomena accompanying the discharge

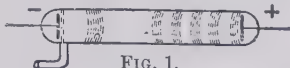


FIG. 1.

disappearing in the meantime. Where this beam of light strikes the glass side of the tube it produces intense phosphorescence. This beam is termed a bundle or stream of cathode rays, and consists of a stream of negatively charged particles moving away from the cathode with enormous velocity. When this stream of cathode rays strikes the glass of the vessel or any object in its path, in addition to phosphorescing the object becomes strongly heated. Professor J. J. Thomson has shown that cathode rays consist of negatively charged particles, and he was enabled to calculate the ratio of the mass of a particle to the electric charge it carried (the same for every particle), and also the velocity with which they move. From other experiments the charge carried by each particle, or ion as he called them, was found, as also the mass. The charge carried by an ion works out to be of the same order of magnitude as that carried by the hydrogen ion in electrolysis, though the mass of a cathode ray ion is only about one-thousandth

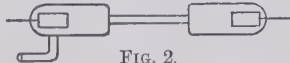


FIG. 2.

of that of the hydrogen atom. The mass has been shown by Kaufmann to be entirely of electrical origin, and not real mass as we understand it in the gravitational sense. The velocity of the rays varies enormously with the degree of exhaustion of the tube, and may be anything between $\frac{1}{10}$ and $\frac{1}{100}$ of that of light.

If the cathode be perforated with a number of small holes, it is found that certain rays known as 'Canalstrahlen' are shot out behind the cathode, just as the cathode rays are shot out in front of it. The 'Canalstrahlen' have been shown to be due to positively charged particles whose

mass is of the order of that of an atom. The charge carried by one of these particles is equal in magnitude to that carried by one of the cathode ray corpuscles.

Lenard Rays.—If a stream of cathode rays is directed against an orifice in the vacuum tube closed by a thin aluminium window, they appear to penetrate it, giving rise to rays on the further side of it (which may be either in the open air or in a second exhausted vessel), similar in many respects to the cathode rays themselves, though instead of travelling onwards as a straight bundle, like the cathode rays, they diverge in all directions from the aluminium window. These rays are known as Lenard rays, and are quickly absorbed in air at the ordinary atmospheric pressure.

Röntgen Rays.—These rays, which are also known as X rays, were discovered by Röntgen in 1895, and are invariably produced by the sudden stoppage of cathode rays, though unless the vacuum tube is highly exhausted they are of feeble intensity, or 'soft rays,' being rapidly absorbed in air. 'Hard rays,' produced in a highly-exhausted tube, will pass through several feet of air before diminishing appreciably in intensity. The cathode rays are usually, in a modern X ray bulb, allowed to impinge on a piece of platinum foil placed in the centre of the bulb at an angle of 45° to the axis; the X rays are then emitted only at the side of the bulb facing this foil. An induction coil is used to excite the bulb, and is usually, for this purpose, worked with a Wehnelt interrupter, though a large Wimshurst machine is also effective.

The real nature of Röntgen rays is not yet fully established. They are certainly not waves like light, and cannot be refracted. In all probability they consist of electro-magnetic pulses in the ether, such as would necessarily be produced by the sudden stoppage of charged particles, according to the theory put forward by Professor Stokes.

Like cathode rays, Röntgen rays produce phosphorescence when they strike a suitable object, such as a screen covered with crystals of barium platino-cyanide; and they are capable of passing through many substances quite opaque to ordinary light—aluminium, paper, wood, the flesh, and numerous other bodies being quite transparent to these rays. The amount of absorption they undergo in passing through any substance—solid, liquid, or gas—is almost proportionate to its density, the heavier metals, for example, being very opaque to X rays. This property of Röntgen rays is of the utmost importance

in surgery, as by interposing the hand, or any part of the body, between an X-ray bulb and a phosphorescent screen, the flesh casts only a very feeble shadow, the bones a much stronger one, while any metal object present casts a perfect shadow on the screen, which may, if desired, be replaced by a photographic plate.

Ionization of Air.—Dry air, usually considered one of the most perfect insulators known, is really a conductor of electricity, although a very poor one, and a charged body, such as a metal sphere or a gold-leaf electroscope, suspended by a quartz fibre, gradually loses its charge when allowed to stand in the open air.

The conductivity of air and other gases may be enormously increased by allowing Röntgen rays to pass through them. In a few moments after the rays have been started the conductivity will have become constant, and many thousand times as great as before, and this conductivity will persist until some moments after the rays have been stopped again. That the air is a comparatively good conductor may be experimentally proved by placing two metal plates at a distance apart of two or three inches, keeping one permanently charged to a high potential by means of a suitable battery whose other terminal is earthed, while the other plate is connected through a sensitive galvanometer to earth. A current will begin to flow through the galvanometer as soon as the rays are started, and will continue until they are stopped.

It has been shown, by Professors J. J. Thomson, Rutherford, Townsend, and others, that the electricity in this case is carried by positive and negative ions or electrons, the negative ions being identical in character with those which form the cathode rays in a vacuum tube. When Röntgen rays are passed through a gas, the gas is said to be 'ionized'—that is to say, a number of the molecules of the gas are split up into positive and negative ions, which move towards the negative and positive electrodes respectively under the influence of an electric field. These ions are continually striking one another and recombining to form neutral molecules, and in a short period after the ionizing source (the Röntgen rays) is removed the gas will have resumed its normal condition.

A gas is also rendered conducting, or ionized, by the rays proceeding from radio-active bodies—such as radium, thorium, or uranium—and by the passage of ultra-violet light (which is supposed to be the source of free ions in the

atmosphere). When ultra-violet light falls on a negatively charged zinc or other electro-positive metal surface, it gives rise to negative ions, which are expelled from the surface in an analogous manner to that in which they are shot off from the cathode in a vacuum tube. Ions are also emitted from a hot wire negatively charged.

See J. J. Thomson's *Conduction of Electricity through Gases* (1903), and J. Stark's *Die Elektrizität in Gasen* (1902).

Vadianus, JOACHIM (1484-1551), Swiss reformer, whose family name was Von Watt, born at St. Gall; became professor of *belles lettres* at Vienna, but returned to his native place (1520), where he practised medicine, and was a disciple of Zwingli. He was the author of *Commentaria* on Pomponius Mela (1518), and *Scholæ* on Pliny's *Natural History* (1531). See Pressel's *Joachim Vadian* (1861), and Göttinger's *J. von Watt* (1895).

Vadstena, tn., Swedish co. Östergötland, on E. shore of Lake Wetter, 48 m. w.s.w. of Norrköping; has a castle of 1545 (now provincial archives) and a fine church (14th-15th century) belonging to St. Bridget's monastery (now a lunatic asylum). Pop. (1900) 2,328.

Vaga, PERINO DEL (1500-47), the name by which Pietro Buonacorsi is commonly known, from his master Vaga, with whom he went first to Rome. Born at Florence, he became a pupil of Ghirlandajo. At Rome he was one of the principal assistants of Raphael in the decoration of the Vatican. In 1527 he removed to Genoa, where his chief works, arabesques, are in the Doria Palace.

Vagabond. See VAGRANT.

Vagrant. By the Vagrancy Acts, 1824 and 1838, which were extended to Scotland in 1871, persons committing certain offences named therein are deemed to be rogues and vagabonds, and may be sentenced to hard labour for any period not exceeding three months. Among such offences the following may be mentioned:—Wandering abroad and lodging in any barn, outhouse, or in the open air; having no visible means of subsistence, and not being able to give a good account of oneself; exposing any obscene print or picture or exhibition in any shop or public place; palmistry; telling fortunes; exposing wounds to get alms; collecting alms under false pretences; deserting wife or children so that she or they become chargeable upon the parish; frequenting public places with intent to commit felony; and possessing burglarious instruments. Any com-

mon prostitute wandering in any place of public resort, and behaving riotously or indecently; any person begging in any public place, or causing any child to do so; any peddler or petty chapman trading without a licence; and any person failing to maintain himself or his family, whereby he or his family become chargeable to the parish, being able by work or otherwise to do so, are deemed to be idle and disorderly persons, and may be sent to prison for a month. Committing any of these offences after having been convicted as an idle and disorderly person makes the person a rogue and vagabond, and punishable as such. An incorrigible rogue is one who breaks out of prison, or who, being convicted as a rogue and vagabond, violently resists the police. He may be committed to the house of correction till the next quarter sessions, and then sentenced to whipping and one year's imprisonment. Under the Vagrancy Act, 1873, any person playing, betting, or gaming in any public place with cards, coins, etc., is also deemed a rogue and vagabond. By the Vagrancy Act, 1898, every male person who (1) knowingly lives on the earnings of prostitution, or (2) persistently solicits in any public place for immoral purposes, is to be deemed a rogue and vagabond, and dealt with accordingly. A male person who is proved to live with, or to be habitually in the company of, a prostitute, and has no visible means of subsistence, is to be taken to be knowingly living on the earnings of prostitution, unless he can satisfy the court to the contrary. The Burgh Police Act (Scotland), 1892, contains provisions for the suppression of vagrancy in Scottish burghs.

A departmental committee was appointed by the president of the Local Government Board in 1904 to inquire into and to report on vagrancy in England and Wales, and in their report the committee recommend that casual wards should be placed under the control of the police, and conducted on a uniform system; that a distinction should be made between vagrants and persons who are *bonâ fide* in search of work; and that the latter class should be assisted, while habitual vagrants should be treated, not as criminals, but as persons who require detention on account of their mode of life. And they recommend that labour colonies for habitual vagrants should be established, and that habitual vagrants should be committed to them for detention for not less than six months or more than three years. See *Report on Vagrancy*, Cd. 2852 (1906), and Turner's *History of Vagrants* (1887).

Vaillant, FRANÇOIS DE. See LEVAILLANT.

Vaishnavas, in Hinduism, worshippers of Vishnu. The marks that distinguish them from the Saivas, the other section, are two perpendicular strokes joined at the lower extremities by a curve (the footprint of Vishnu) marked on their foreheads in red, yellow, and white pigments.

Vaisyas, the third of the four classes into which Hindus were divided on the institution of caste. Their occupations, as set forth in the Puranas, are commerce and agriculture, and the feeding of flocks and herds. At the present day nearly all who profess to be Vaisyas are merchants and traders.

Valabhacharya, a sect founded by one Valabha, a Telugu Brahman, born towards the close of the 15th century. Adopting at Kathiawar the worship of Krishna in its most sensuous form, he represented himself as an incarnation of that god. He died at Benares. His descendants receive adoration little short of divine honours from adherents in the Bombay Presidency and Central India.

Valais, Swiss canton, the third largest in the confederacy. Area, 2,027 sq. m.; pop. (1900) 114,158, of whom two-thirds are French-speaking, and all Roman Catholics. It produces little but wine; but its wild and romantic scenery attracts many travellers in summer. It comprises the upper course of the Rhone, and its capital is Sion or Sitten (pop. 6,995). Valais was for centuries a sister confederation of the Swiss league, which it entered in 1815.

Valckenaer, LODEWYK KASPAR (1715-85), Dutch philologist, born at Leeuwarden; professor of Greek at Franeker (1741-66); taught at Leyden from 1766. He issued valuable editions of Greek and Latin classics. After his death some of his works were published as *Opuscula philologica, critica, oratoria* (1808-9), and *Selecta ex Scholiis Valckenarii* (1815-17). See Bergmann's *Memoria Valckenarii* (1874).

Valdemar. See WALDEMAR.

Valdenses. See VALDENSES.

Valdepeñas, tn., prov. Ciudad Real, Spain, 30 m. S.E. of Ciudad Real; famous for its wine. Pop. (1900) 21,015.

Valdés, ARMANDO PALACIO (1853), Spanish novelist, born at Entralgo (Asturias); the leader of the naturalist school of fiction. His best works are *Sister St. Sulpice* (Eng. trans. 1890) and *Maria y Maria* (1883). His more recent novels, such as *Faith* (Eng. trans. 1892), *Scum* (Eng. trans. 1890), and *The Joy of Captain Ribot* (Eng. trans. 1900), though strong and striking, exhibit too openly

the influence of Zola to be regarded as typical Spanish creations.

Valdes, JUAN DE (c. 1500-41), Spanish reformer and writer, born at Cuenca. For the last ten years of his life (1531-40) he lived at Naples. His anonymous *El Diálogo de las Lenguas* (c. 1536), a satire on the abuses of church and state, is the finest piece of Castilian prose of that age, except perhaps *El Diálogo de Mercurio y Carón*, by the same author. His *Ciento y Diez Consideraciones Divinas*, the work by which he is best known abroad, was translated into English by N. Ferrar in 1638 and by Betts in 1865. See E. Boehmer's *Life of Valdes* prefixed to *Biblioteca Wiferriana* (1882).

Väl de Travers, beautiful valley in canton Neuchâtel, Switzerland, between the ranges of the Jura, 12½ m. S.W. of Neuchâtel; gives name to an asphalt cement.

Valdivia, PEDRO DE (c. 1510-69), Spanish conqueror of Chile. As Pizarro's lieutenant, he led the second expedition (1540) against Chile. After fighting his way to the river Mapocho, he founded Santiago, the present capital, and some ten years later a second city, which he named after himself. Meantime he was hard pressed by the Araucanians, and was killed in battle against them near Valdivia.

Valence (Rom. *Valentia*), tn., cap. of dep. Drôme, France, on l. bk. of Rhone, 58 m. S. of Lyons; has manufactures of glass, silk, hosiery, and the printing of handkerchiefs. Its Romanesque cathedral was consecrated by Urban II. in 1095. Pop. (1901) 24,199.

Valencia, or VALENTIA, rocky island, W. of Co. Kerry, Ireland, S. of Dingle Bay; has slate quarries, and is the terminus of several Atlantic cables.

Valencia. (1.) Province, E. Spain, one of the most fertile districts in Europe, conquered from the Moors by James I. of Aragon in 1238; and in spite of the expulsion of the Moriscos (1610), it has always remained the most Moorish part of Spain. Watered by the Jucar and Turia (or Guadalaviar), the plains produce rice, wine, grain, oil, and fruit in incredible abundance. The silk industry, once very great, is still considerable, and mats, cordage, tiles, and earthenware are largely produced. Area, 4,150 sq. m. Pop. (1900) 806,556. (2.) City, cap. of prov. of same name, Spain, on the Guadalaviar, and 3 m. from its port El Grao, on the Mediterranean. It is one of the most important cities in Spain, and stands on a fertile alluvial flat, between the mountains and the sea. Its cathedral, though much spoiled by restoration, has fine

paintings of the Valencian school; and many pictures by Ribalta are in other churches and public buildings. The art school is the most important in Spain. Tobacco, silk, fans, and gloves are manufactured. Pop. (1900) 213,550. (3.) Chief town of state of Carabobo, Venezuela; is connected with Puerto Cabello by rail (36 m.), over a pass in the coastal range only 1,970 ft. high. The cathedral was built in 1813. Pop. 40,000.

Valenciennes (Lat. *Valentiana*), tn., dep. Nord, France, on Scheldt, 18 m. N.E. of Cambrai; has manufactures of coarse lace, hosiery, cambric, glass, and iron goods. The manufacture of lace has been discontinued for fifty years. Froissart the historian and Watteau the painter were natives. Pop. (1901) 28,786.

Valency of an element is the number of hydrogen atoms that one atom of it can unite with, or replace in a chemical compound. (See ATOMICITY.) Thus carbon is tetravalent, as one atom of it unites with four of hydrogen. Valency is determined by dividing the atomic weight by the equivalent of the element—i.e. the weight of the element that unites with or replaces unit weight of hydrogen: thus, as nine parts by weight of aluminium set free one part of hydrogen, and as the atomic weight of aluminium is 27, the valency equals $27 \div 9 = 3$. Certain compounds, such as carbon monoxide and dioxide, appear to indicate that elements may have more than one valency, and much discussion has taken place on this point. If valency is a fixed quantity, it should be a property of the atom like the mass; but if variable, it might depend on the condition of the atom, such as its temperature or electric charge. But if valency were variable and depended on the condition of the atom, it should alter gradually in any given element, and not with leaps and bounds, as is found to be the case. Thus in carbon monoxide and carbon dioxide the change is apparently from divalent to tetravalent, whilst in ammonia and ammonium chloride it is from trivalent to pentavalent. Such a difference can be explained on the fixed valency assumption, by supposing that in the compounds in which the lower valency is apparently indicated the full capacity for union is not exerted, and that such compounds are 'unsaturated'—a view that is confirmed by the readiness with which such compounds take up additional atoms without rearrangement. On the other hand, though this idea seems to be correct in some cases, such as that of carbon, with other elements, such as nitrogen

and phosphorus, the compounds in which there is the higher valency are easily broken up into different molecules—for example, $\text{PCl}_5 = \text{PCl}_3 + \text{Cl}_2$ —or are formed like ammonium chloride, $\text{NH}_3 + \text{HCl} = \text{NH}_4\text{Cl}$, without any apparent expenditure of energy (ignition) being required to split up existing molecules before the new ones could be formed, as is the case when oxygen and hydrogen combine. In cases like the formation of ammonium chloride, and to explain the formation of compounds containing water of crystallization—e.g. alum, $\text{K}_2\text{SO}_4 \cdot \text{Al}_2(\text{SO}_4)_3 \cdot 24\text{H}_2\text{O}$ —it has been suggested that combination of a different order to atomic union occurs, whole molecules uniting as such to form 'molecular' compounds.

To explain valency it has been calculated that the force of attraction between atoms in combination—for the union must be of that character and not of the nature of a mechanical joint—can only be uniformly distributed over the surface of the atom, if the latter is truly spherical, and that with other shapes points must exist in which there is a greater attractive force. Thus, for a monovalent atom there would be one salient point, for a divalent two, and so on—an idea that is confirmed in the case of carbon by other considerations pointing to its affinities being situated at the angles of a regular tetrahedron. Similarly, the helium and argon atoms from their physical properties are believed to be perfect spheres—a fact which, according to this theory, would explain why these elements exhibit no valency and form no compounds. In the case of nitrogen it may be imagined that there are three major and two minor prominences, the latter having a weaker attractive force and becoming ineffective sooner when the atom is heated or otherwise agitated. Lastly, molecular compounds might quite well be formed by the attraction of minor prominences, or by the prominences formed by the various atoms in the molecule. Similar results would obtain if, as has also been suggested, instead of the various valencies being the result of differences in shape of the atoms, they are the result of different dispositions of the electrons in the atom.

Valens. (1.) **FABIUS**, a lieutenant of Vitellius, whom after Nero's death he persuaded to seize the empire, and for him won the first battle of Bedriacum over Otho's troops in 69 A.D. Cæcina was his colleague in this battle, and also in the government of Rome afterwards. After the victory of Vespasian, Valens, rival of Vitellius, at the second battle

of Bedriacum tried to escape to Gaul, but was captured near Marseilles, and was put to death. (2.) **FLAVIUS** (c. 328-78 A.D.), emperor of the Eastern Roman empire from 364 to 378, was born in Pannonia; a brother of Valentinian I., by whom he was raised to the throne. Valens was an Arian, and his reign was marked by severe persecutions of orthodox Christians. From 373 to 375 he was at war with Persia, but without much result. The earlier years of his reign were occupied with wars with the Goths north of the Danube, in which he was usually unsuccessful; but in 377 the pressure of the Huns on the Goths caused the latter to ask for leave to settle south of the Danube. This was given; but war soon broke out between the Goths and Romans, and on Aug. 9, 378, in a great battle fought not far from Adrianople, two-thirds of the Roman army were killed, and Valens himself perished.

Valentine, **BASIL**, the assumed name of an alchemist who lived in the 15th century, and was probably born at Erfurt. He discovered and investigated many chemical substances and processes, made a beginning with the application of chemistry to medicine, and, though his work was fantastic and obscure, distinctly advanced the dawn of chemistry as a science. See his *Curus Triumphalis Antimonii* and *Halographia*.

Valentine, **SAINT**, and **SAINT VALENTINE'S DAY**. St. Valentine is believed to have been a bishop who suffered martyrdom under Claudius II. at Rome, or, according to others, under Aurelian in 271 A.D., on February 14. The old idea was that the birds began to mate on that day; hence the practice of young people choosing their 'valentines' on that day by sending missives of an amatory or satirical nature, generally anonymously. The day was only observed in Britain, where, however, it has now fallen into disuse. A similar custom once prevailed in France on the first Sunday in Lent. It may have been a remnant of the pagan festival in honour of Pan and Juno (February 15).

Valentine and Orson, a famous romance of the time of Charlemagne, composed in the reign of Charles VIII. of France, and first printed at Lyons (1489). Valentine and Orson are twin brothers, Orson being carried off by a bear, and Valentine by his uncle, King Pepin. Hence the modern typification of them—the one as a specimen of uncouthness, the other of courtesy.

Valentinian, three emperors of Rome. (1.) **FLAVIUS GRA-**

TIANUS VALENTINIANUS I. (321-75 A.D.), emperor from 364 to 375 A.D., was a native of Pannonia. On his accession he associated his brother Valens with himself, making him emperor of the East, while he chose himself to rule the Western empire. Valentinian spent the greater part of his reign in Gaul, chiefly at Rheims or Treves, improving the frontier defences of the empire along the Rhine. He won victories over the Alemanni and Saxons. Valentinian was an orthodox Christian,



Common Valerian.

1, Flower; 2, section; 3, fruit.

and tolerant to all forms of religion, though he severely punished professors of magic. He was a strong and able ruler; his private character was virtuous and unostentatious. (2.) **VALENTINIAN II.** (371-92 A.D.), younger son of the above, was chosen emperor with Gratianus, his elder brother—Valentinian ruling in name Italy, Illyricum, and Africa, while Gratian had Gaul, Spain, and Britain; but, in fact, Gratian governed the whole West until his murder, in 383. Valentinian then ruled, aided by Theodosius I.; but in 392 he was murdered at Vienne by Arbogast, commander of the Roman troops in Gaul. (3.) **VALENTINIAN III.** (420-55 A.D.), son of Constantius III. by Placidia, sister of Honorius and daughter of Theodosius I., was made emperor of the West by Theodosius II. in 425 A.D. For the first twelve or fifteen years of his reign Valentinian's mother

governed for him. Under his rule Carthage was taken by the Vandals under Genseric in 439, who thus won most of Roman Africa, and proceeded in 440 to ravage Sicily. The Goths held much of Gaul, and the Vandals more of Spain. In 446 Britain was abandoned. In 451 Attila and his Huns invaded the empire, but were routed by Aetius at Châlons-sur-Marne, though in 452 they invaded Italy. In 454 the emperor was made enough to murder with his own hand Aetius, 'the last of the Romans.' In the next year he was himself murdered, at the instigation of Petronius Maximus, whose wife he had forced into adultery with him.

Valentinus, heretical theologian of the 2nd century, belonged to Egypt, and gained a great

reputation as a philosopher in Rome (c. 140-160 A.D.), entering the lists of controversy with Justin Martyr. His views were characteristically Gnostic; his doctrines may be regarded as the high-water mark of the system. His followers split into two schools—(1) the Italian, to which belonged Ptolemæus, Marcus, and Heraclion; (2) the Anatolian, embracing Theodotus, Axionicius, and Bardesanes.

Valenza, tn., Piedmont, N. Italy, on r. bk. of Po, 9 m. by rail N. of Alessandria; has manufactures of silk. Pop. (1901) 10,956.

Valera y Alcalá Galiano, JUAN (1824-1905), Spanish author and politician; entered diplomatic life in 1847, and after filling an appointment at Madrid,

Nuevos Estudios Críticos (1888) are written, like his fiction, with uncommon purity of style.

Valerian, whose full name was PUBLIUS LICINIUS VALERIANUS, emperor of Rome from 253-60 A.D., rose to consular rank before 237. He associated his son Gallienus with himself in the government, and then prepared to resist the barbarians who were threatening the frontiers. The Persian Sapor's invasion of Syria and capture of Antioch (257 A.D.) appeared the most pressing necessity. Valerian recovered Antioch, and drove the Persians back beyond the Euphrates; but pressing on too fast, he was taken prisoner, and was kept for the rest of his life in captivity in Persia.

Valeriana, a genus of mostly hardy shrubs and herbaceous

plants belonging to the order Valerianaceæ. They bear usually corymbs of small white or rosy flowers, with short tubular corollas. The common valerian, or all-heal (*V. officinalis*), bears corymbs of rosy flowers in summer. A golden-leaved variety is sometimes cultivated in gardens.

Valerianaceæ, a natural order of shrubs and herbaceous plants, mostly natives of temperate regions. Among the genera are Valeriana, Centranthus, Nardostachys, and Patrinia.

Valeric (or VALERIANIC) ACID, C_4H_9COOH , occurs in four isomeric varieties, two of which—viz. isovaleric acid and methyl-ethyl acetic acid—occur in plants such as valerian. The mixture of these two latter, which is generally known as valeric acid,

is an oily liquid, with an unpleasant and very persistent odour like that of decayed cheese. It forms salts, and is sometimes employed in medicine, but is of doubtful value.

Valerius Flaccus. See FLACCUS.

Valerius Maximus (c. 30 A.D.), Roman rhetorician, wrote a collection of historical anecdotes disfigured by indiscriminate flattery of Tiberius and an overloaded style. See *Speed's Acts and Sayings of the Ancient Romans* (1678).

Valeтта, or LA VALETTE, tn., cap. of Malta, and most important British naval and coaling station in Mediterranean, occupies a rocky peninsula on N.E. coast. The town and its two harbours and four dry docks are defended by



Valetta: Entrance to Grand Harbour.

forts, partly constructed in 1530 by the Knights of St. John. Some of the streets are broad and level, others are mere stairways. Among the many fine buildings are the cathedral, the palace of the grand-masters of the Knights of St. John, and the university. Pop. 62,000.

Valette, JEAN PARISOT DE LA (1498-1568), grand-master of the Knights of St. John, for many years effectively checked the advance of the Turks. His greatest feat was his defence of Malta during a four months' blockade by the Turkish fleet in 1565.

Valguarnera, tn., prov. Caltanissetta, Sicily, 24 m. E. of

Valk, tn., Livonia, N. W. Russia, 97 m. N.E. of Riga; a railway junction, with distilleries, breweries, and manufactures of hydromel and flax. Pop. (1897) 10,139.

Valkyries, in Scandinavian mythology, supernatural maidens of great beauty who chose the slain in battle for transportation to Valhalla. It is they who hand to the warriors their drinking-horns at their daily feast with Odin. Their number is variously given as three or some multiple of three. The love of one of them, Brunhilda, and Siegfried is the theme of Wagner's opera *Die Walküre*.

See monographs by Mancini (1892), Max von Wolff (1893), and Schwabe (1896).

Valladolid, (1.) Province, Spain, including a portion of the valley of the Douro. It is mainly agricultural, and produces much wine; but there are also considerable weaving and leather work. Area, 3,043 sq. m. Pop. (1900) 278,561. (2.) City, cap. of above prov., Spain, 100 m. N.W. of Madrid, on the Pisuerga and canal of Castile, near the junction with the Douro. It was the capital of Spain before Madrid. Columbus died and Cervantes lived here. It contains the royal palace of Philip III. and the palace of Car-



The Valhalla, Ratisbon.

(Photo by Photochrom Co.)

Caltanissetta; has trade in olive oil and sulphur. Pop. (1901) 14,051.

Valhalla, in Scandinavian mythology, the great hall of the gods, where the warriors slain in battle spent their future existence. It was entered by 540 doors, through each of which 800 warriors could march abreast. The heroes engaged in fierce warfare with one another as their daily sport, but each day their wounds were healed before they sat down to feast with Odin.

Valhalla, a building erected near Ratisbon by Ludwig I. of Bavaria, in honour of German patriotism and liberty, between 1830 and 1842; 250 marble steps lead up the side of an eminence to the temple, also of marble.

Valla, LAURENTIUS (c. 1407-57), Italian humanist, was born at Rome; taught at Pavia, Milan, and Naples. After proving the falseness of the 'gift of Constantine' he was forced to flee to Rome. There he held various posts under Nicholas I. and Calixtus III. In philosophy Valla vindicated freer thought and methods than scholasticism had permitted; in letters his translations of Herodotus (1510) and Thucydides (1543), and his *De Elegantia Linguae Latinae* (1471), were long standard works. Erasmus edited his New Testament commentary. The *Opera* were first collected at Basel in 1543. The treatise *De Donatione Constantini* has been edited by Barozzi (1891) and Vincenti (1895), the latter in Latin and Italian.

dinal Mendoza, now a museum. Here are the works of the Northern Ry. Pop. (1900) 68,789.

Valladolid, tn., Yucatan prov., Mexico, 100 m. S.E. of Mérida; has cotton manufactures. There are remains of a cathedral and of a fine Franciscan convent, destroyed by Indians in 1848. Pop. (mainly Indians) 14,000.

Vallauri, TOMMASO (1805-97), Italian scholar, born at Chiusa di Cuneo in Piedmont. In 1843 he was appointed professor of Latin at Turin, which chair he held until a year or two of his death. His editions of Plautus, Terence, Horace, Catullus, and Cicero are held in special esteem. He also published a Latin lexicon, an autobiography (1879), and *Storia della Poesia in Piemonte* (1841).

Valle, PIETRO DELLA (1586-1652), Italian traveller, was born at Rome, 1843, and in 1614 started for the East, from which he did not return until 1626. The *Viaggi in Turchia, Persia, ed India* appeared in 1650-8 (best edition by Brighton, 1843, with the Life by Bellori). It was translated into English by G. Havers (1664), and this version was edited for the Hakluyt Society by G. E. Grey (1892).

Vallejo, seapt., on San Pablo Bay, Solano co., California, U.S.A., 36 m. N.E. of San Francisco; has a good harbour, and is the outlet of a fruit-growing district. A United States navy

terraced slopes are formed, as the Colorado cañon. In such valleys waterfalls are found where the stream passes down the minimum line off a harder on to a softer stratum.

The normal section of a water-formed valley is V-shaped. The steepness of the sides depends on the resistance of the rock, the relationship of weathering on the sides to the activity of the stream in the bed, and the length of time for which the valley has been subjected to erosion. Valleys in semi-arid areas with a river coming from rainier lands have steeper slopes than those in rainy regions. Their tributaries do not

treel; has cotton, paper, and flour mills. It is the see of a Roman Catholic bishop. Pop. (1901) 11,055.

Vallière, La. See LA VALLIÈRE.

Vallisneria, a genus of half-hardy, aquatic, submerged plants belonging to the order Hydrocharidaceæ. The only species is the eel grass or tape grass (*V. spiralis*), which is much grown in aquaria. The flowers are unisexual, the female flowers at the time of maturation floating on the surface of the water, whilst the male flowers become detached from the plant and also reach the surface of the water.



Valparaíso: Monumento de la Marina.

yard is situated on Mare I., opposite. Pop. (1900) 7,965.

Valley, a land form elongated in plan, with sloping sides that meet in a minimum line, which has a more or less regular slope downwards from the head of the valley. The normal valley is water-worn, the descending minimum line being that of a stream; but in many cases, more particularly on the polar sides of latitudes 45° N. or S., at some relatively recent geological period ice has passed down the valley and left its mark on its contours. In arid and semi-arid areas an originally water-worn valley may be modified by wind action. Should the horizontal layers of a sedimentary rock or lava flow be of unequal resistance, then

always enter at the base of the main valley, but form 'hanging valleys.' The younger valleys are usually the more steep-sided, the older ones the more gently sloped. Where glacial action has been potent the V-shaped valley is widened at the bottom into a U-shaped one, and the lateral valleys frequently debouch at heights considerably above the base of the main valley. The question of the exact effect of glacial action in producing this is a matter of controversy. See James Geikie's *Earth Sculpture* (1898), J. E. Marr's *Scientific Study of Scenery* (1900).

Valleyfield, tn., Beauharnois co., Québec, Canada, on r. bk. of St. Lawrence, 30 m. S.W. of Mon-

Vallombrosa, Benedictine convent, Florence, Italy, among the Apennines, 16 m. E.S.E. of Florence, in the midst of magnificent woodlands. It was founded about 1038 by St. John Gualbert, and rebuilt in 1637. Suppressed in 1869, the abbey is now a school of forestry and a popular summer resort. Milton alludes to it in *Paradise Lost*, i. 3,030, and Ariosto in *Orlando Furioso*.

Vallota, a genus of S. African bulbous plants belonging to the order Amaryllidaceæ. The only species is *V. purpurea*, the Scarborough lily, which bears many-flowered umbels of red, infundibuliform flowers in late spring. Scarborough lilies should be surrounded with sand, and then covered with about eight inches

of a mixture of sand, fibrous loam, and leaf-mould. This bulb should be left undisturbed for many years. A greenhouse temperature is required.

Valls, city, prov. Tarragona, Spain, 11 m. S. of Tarragona; has cotton, hemp, and woollen weaving. Wine and Barcelona nuts are also produced. Pop. (1900) 12,625.

Valmy, vil., dep. Marne, France, 20 m. N.E. of Châlons; has a pyramid to commemorate the victory of the French under Kellermann (afterwards created Duc de Valmy) and Dumouriez over the Prussians under the Duke of Brunswick (Sept. 20, 1792).

Valois, HOUSE OF, a French dynasty which ruled from 1328 to 1498. The first king was Philippe VI. (1328-50). During his reign and those of John (1350-64) and Charles V. (1364-80) France was brought low by the ruinous war with England. The battles of Crecy and Poitiers (1346 and 1356) demoralized the chivalry of France, and King John was taken captive at Poitiers and conveyed to London. France reached her period of deepest depression after her defeat at Agincourt (1415). From this she was raised by Jeanne d'Arc, and Charles VII. (1422-61) was crowned at Rheims. He formed a regular army, paid by a special tax. Louis XI. (1461-83) gained power by systematically humbling the great princes and nobles. He added Maine, Anjou, Provence, and part of Burgundy to the crown. Charles VIII. (1483-98), the last of the direct line of Valois, obtained Brittany by his marriage with Anne. He died without male issue, and the crown fell to Louis, son of Charles, Duke of Orleans, who ascended the throne as Louis XII., the first of the Valois-Orleans house.

Valois, CHARLES DE. See ANGOULEME, DUC D'.

Valona. See AVLONA.

Valonia consists chiefly of the acorn cups of *Quercus agrifolia*, and is usually employed in tanning along with oak bark.

Valparaiso, chief port of Chile, cap. of prov. of same name, situated on a bay, well sheltered, except from the N. The town, built partly on the shore, partly on the slopes of the hills, which rise from 1,000 ft. to 1,400 ft. behind it, is modern, and resembles English towns in appearance. The harbour is strongly fortified, and the Chilean naval school is situated near the town. Typhoid fever is very prevalent. East of the town is the watering-place of Viña del Mar. The total foreign trade amounts to six or seven millions sterling annually. Pop. (1900) 135,674.

Valpy, RICHARD (1754-1836), schoolmaster, born in Jersey; was headmaster of Reading school (1781-1830), and in 1787 also became rector of Stradishall, Suffolk. His classical grammars achieved a wide reputation. Valpy's brother Edward (1764-1832) was author of *Elegantia Latine* (1803) and *The Greek Testament, with English Notes* (1815).

Valtellina, the valley of the upper Adda, Sondrio prov., Italy. It extends 44 m. westward to Lake Como, and includes the Liro valley.

Valuation. See APPRAISEMENT, RATING, DOMESDAY BOOK, and EXPENT.

Valuation List. See RATING.

Value, the fundamental conception in the science of economics, is the quality which makes wealth. It is not to be confounded with price, which is value expressed in terms of one article—viz. gold or silver. All values are not capable of being expressed in such terms. Consequently there may be wealth that has no price, but never wealth that has no value. Political economists are chiefly concerned with the question of the origin of value, and they have drawn very many useful distinctions, the most important of which is that between value in use and value in exchange. To the latter they confine the term value; and for them, as for the business world, an article has value when somebody will give something for it. But what determines this willingness to give something? The answer is 'value in use,' or, as economists prefer to call it, 'utility.' Utility for the economist signifies any article or commodity which satisfies some desire of man. There is no moral judgment implied, and strong drink and temperance trusts alike may have value. But things have different values, and whence arises the difference? It is the relative scarcity that determines the relative value. For measure of value and standard of value see MONEY. See Smart's *Introduction to the Theory of Value* (1891).

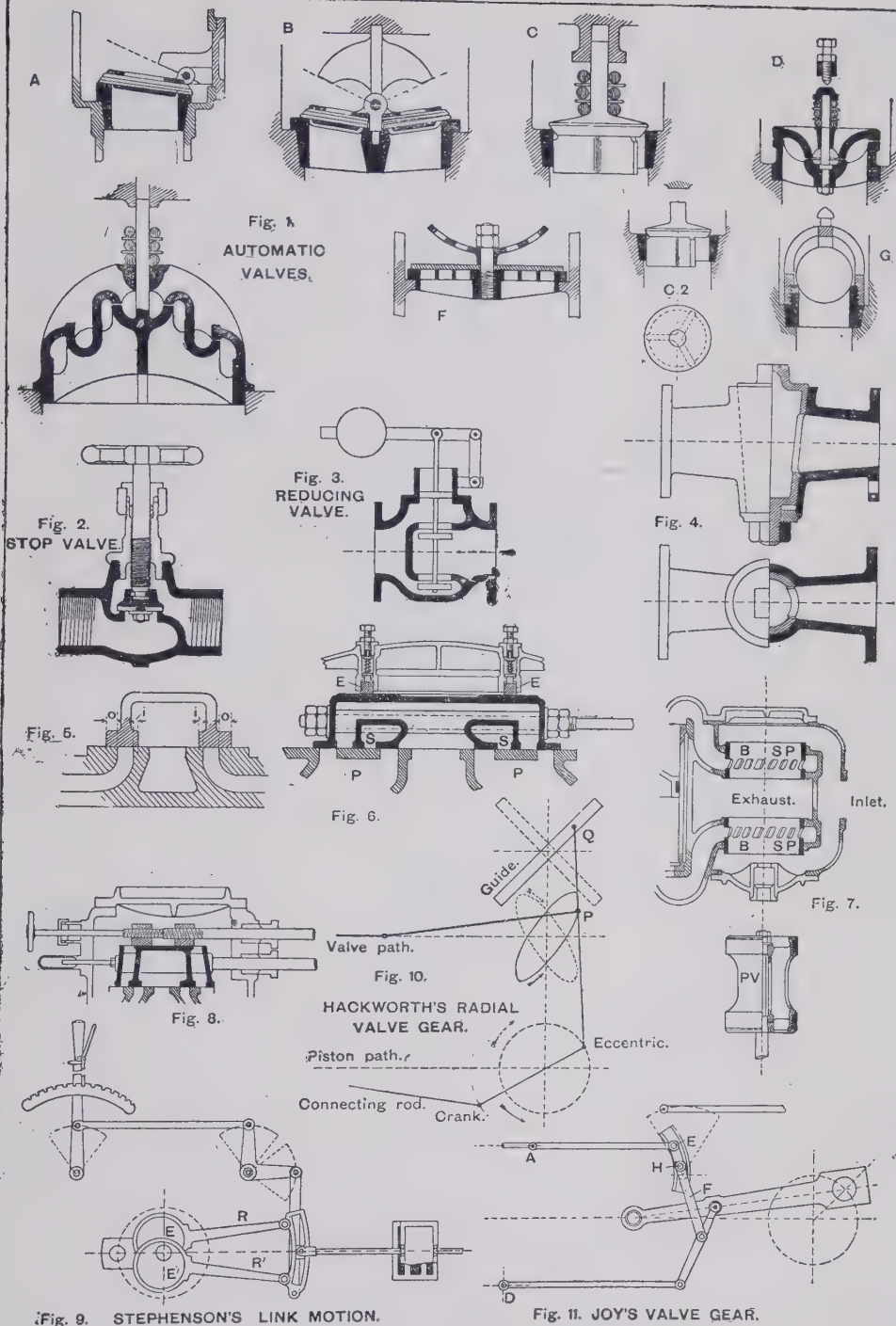
Valves, in botany, the two halves of which the microscopic unicellular plant known as diatom is composed. One of these valves fits over or overlaps the other. They are also known as frustules. The term valves is also applied to the pieces into which the capsule of a flowering plant breaks.

Valves and Valve Gear. A valve is a contrivance for controlling the motion of a fluid along a passage.

Automatic Valves.—The accompanying figures show some of the common types of automatic valves. (Fig. 1.) A is a flap valve, con-

sisting of a hinged metal plate, with a piece of leather fastened to it to make the joint. A guard prevents the valve from opening too far. Small valves of this kind work well at low pressures if the number of beats be not too great. They are often fitted to suction pipes of pumps to prevent the water from draining out of the pump when it is not working. At B we have two flat valves placed back to back and known as a 'butterfly valve.' C is a mushroom or puppet valve. It consists of a brass disc sitting on a brass seat, usually conical, but sometimes flat. It is guided by three feathers or wings below the valve, which work easily in the seating. C2 gives the plan and section of an ordinary mushroom valve; the valve C is shown with an arrangement to facilitate closing, consisting of three rubber rings separated by washers, a certain amount of lift usually being allowed before the rings begin to act. Sometimes a spring is used instead of the rubber rings; but often the valve closes merely by its own weight. In order to give the same area of flow as in the pipe, the lift of a valve of this type is one-quarter the diameter of the valve. To ensure the valve closing tightly, the bearing surface must be narrow (from r_1 to r_2), and in a large valve, having the necessary lift, the shock of closing would be sufficient to damage the seating and valve face. This difficulty is to some extent got over in the double-beat valve, shown at D; this has two seats, and requires only half the lift that would be necessary with a single-beat valve of the same diameter. At E is shown a four-beat valve, as used on large pumping engines. F is an india-rubber disc valve. It consists of a circular plate of rubber resting on a gun-metal grid, and held at the centre by a bolt, a saucer-shaped guard-plate limiting the rise of the rubber disc. This type of valve is much used for air pumps of condensing engines. G represents a ball valve, a type often used for small high-speed pumps.

Non-automatic Valves.—Fig. 2 represents an ordinary stop valve to be opened and closed by hand. It consists of an ordinary lift valve, raised and lowered by a screwed spindle working in a nut. The spindle passes through a stuffing box to prevent leakage, and is provided with a hand-wheel. The valve is fixed to the spindle, so that it does not turn with it, to prevent grinding of the valve on its seat. For steam-valves the valve faces are of gun-metal; for water-valves one of the faces may be india-rubber, leather, or fibre.



Diagrams of Valves and Valve Gear.
(For explanation, see text.)

Reducing Valves.—Fig. 3 shows diagrammatically a valve for reducing the pressure of a gas below the pressure of supply. It consists of a double-beat or equilibrium valve, worked by a piston, the piston being loaded by means of a weighted lever. When the pressure rises above that corresponding to the load on the piston, the piston rises and closes the valve; when the pressure falls below this amount, the weight forces the piston down, opening the valve. A dashpot (not shown in the figure) is provided to prevent the tendency of the piston to oscillate up and down, technically known as 'hunting.' The efficient working of these valves depends upon there being very little friction in the working parts; but in all cases, if the vessel on the low-pressure side of the valve is not capable of carrying the full pressure behind the valve, a relief valve should be fitted, to guard against failure of the reducing valve.

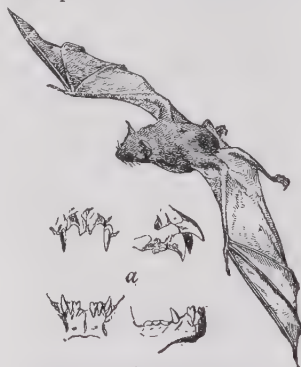
Cocks.—These are valves consisting of a conical plug, fitting in a corresponding seating. (See Fig. 4.) There is a hole through the plug, which coincides in one position with the passage in the seating. By rotating the plug the blank portion is brought opposite the hole in the seating, and blocks the passage. The conical form of the plug enables it to be reground when necessary. Owing to the suddenness with which they close, cocks are not suitable for use as water-valves, unless the velocity of the water in the pipe is small, as the sudden stopping of the motion of the water on closing the valve subjects the pipe to considerable shocks.

Slide-valve.—This is the valve chiefly used to regulate the admission of steam to the cylinder of an engine. See *STEAM-ENGINE and PUMPS*; also Dalby's *Valves and Valve Gear Mechanisms* (1905), Zenner's *Valve Gears* (4th ed. 1905), and Hurst's *Valves and Valve Gearing* (3rd ed. 1903).

Vambéry, ARMINIUS (1832), Hungarian traveller and Orientalist, was born at Szerdahely, on an island in the Danube. After teaching himself Turkish and Arabic, Vambéry, disguised as a dervish, penetrated to Khiva and Bokhara as far as Samarkand (1862–4). This is described in *Arminius Vambéry, his Life and Adventures* (1883), and *Travels and Adventures in Central Asia* (1864); also in *Sketches of Central Asia* (1867). After his return home he was appointed professor of Oriental languages at the University of Budapest. He has written on the *History of Bokhara* (1873), *The Central Asian Question* (1874), *The Coming Struggle for India* (1885), *Story*

of Hungary (1887), *Western Culture in Eastern Lands* (1906), and on the ethnography and literature of Central Asia. He is a strenuous advocate of Britain as opposed to Russia throughout the East. See *The Story of my Struggles: the Memoirs of A. Vambéry* (2 vols. 1904).

Vampire. As stated in Horace Walpole's *Letters* (vol. i. p. 109), George I. was fully convinced that such creatures actually existed. The supposed characteristics of vampires are these:—They are men and women who have apparently died, but who continue to live in their graves without any signs of corporeal decay. It is their nightly custom to emerge from the tomb and suck the blood from sleeping people, returning night after night to the same victim, who consequently languishes and dies. An excellent idea of this superstition is obtained from Mr. Bram Stoker's novel of *Dracula* (1897). The vampire was known to the people of Chaldaea and Babylon, and is referred to in an Assyrian tablet in the British Museum. The creature mentioned in Proverbs (30:15) as a 'horse leech' is also spoken of as a vampire. The werewolf is in several respects akin to the vampire. In his tale of 'The Vampire' in *Gypsy Folk Tales* (1899), F. H. Groome states that he takes that word as an equivalent for *revenant*, or spectre. The ghoul of Arab folk-lore has been likened, but erroneously, to a vampire.



Vampire-bat (*Desmodus rufus*).
a, Dentition.

Vampire-bat. The true vampire-bats are *Desmodus rufus* and *Diphylla ecaudata*, both South American forms. The former has been actually captured in the act of blood-sucking, like the vampire of fable. The first species is only three inches long, and the second smaller, and the victim in the case described by Darwin was a horse. The bat seems to cut through the skin

with its sharp incisor teeth, and then sucks the blood which exudes from the wound. The so-called great vampire (*Vampirus spectrum*) of S. America is a very ugly creature, with a wing expanse of twenty-eight inches; but it is largely a fruit-eating form, and there is no proof that it ever sucks blood.

Van, chief tn. of vilayet of same name, Armenia, Asiatic Turkey, near E. shore of Lake Van, 145 m. S.E. of Erzerum; has manufactures of cotton goods and moiré. Its citadel crowns an isolated ridge, on which appear cuneiform and other inscriptions. The suburb Baghlar extends over the plain below. Van is believed to occupy the site of Thospia, the capital of the kingdom of Biaina. Pop. 30,000. Lake Van extends from 30 to 80 m. E. to W. and from 20 to 40 m. N. to S., and has no visible outlet.

Vanadium, V, 51.2, a somewhat rare metallic element, of which the principal sources are mottramite, a lead-copper vanadate, and vanadinite, or lead vanadate. The ores are converted into ammonium metavanadate, from which the acid anhydride, vanadium pentoxide, and the vanadates are obtained. The element itself is set free by the reduction of the dichloride in hydrogen. Vanadium is a gray, very infusible metal (m.p. 1,680° C., sp. gr. 5.9), and though it has been experimented with as a component of steel, has hardly been applied on the commercial scale. It yields several oxides, the lower ones being metallic powders, whilst the higher, V₂O₅, yield vanadic acid, which, with the vanadates, is employed in the preparation of aniline black and for colouring glass.

Van Beers, JAN (1821–88), Belgian poet (surnamed 'the Elder' in distinction from his son, the well-known Belgian painter), was born at Antwerp, and became sub-librarian of the communal library; thereafter teacher of the Dutch language and literature at Malines, then at Lierre, until he was elected professor of this subject at the Antwerp Athenæum. His grammar and reading-book did much to help on the Flemish revival. His poems have had the same influence, the chief being *Jakob van Maerlaet* (1860), *Jongelingsdroomen* (1853), *Levensbeelden* (1858), *Rijzende Bladen* (1883). Collected editions of his poems appeared in 1873, 1884, and 1885. See *Life*, by Stecher, in *Annuaire de l'Acad. Roy. de Belgique* (1890).

Vanbrugh, IRENE and VIOLET, English actresses, were born at Exeter. Irene was a member of Mr. Toole's company in 1889. She toured in Australia, and was asso-

ciated with Mr. Beerbohm Tree in 1892. Violet appeared in London first with Mr. Toole, and then joined the Kendals. She toured in America, and was associated with Sir Henry Irving as Anne Boleyn in *King Henry VIII*.

Vanbrugh, or **VANBURGH**, SIR JOHN (1664-1726), English dramatist and architect, was born in London. He served in the army from 1686 to 1696. His first play, *Relapse*, appeared in 1697; it was followed by *Æsop* and *The Provoked Wife* (1697), *The False Friend* (1702), *The Confederacy and The Mistake* (1705). In 1701 he built Castle Howard, and in 1705 drew up plans for Blenheim House, which were ultimately carried out. Vanbrugh became comptroller of works (1702), Clarencieux king-of-arms (1704-26), and was knighted in 1714. His plays are gross, but are sparkling with wit, while his architectural works are original and massive. See W. C. Ward's *Life of Vanbrugh* (1893).

Van Buren, MARTIN (1782-1862), eighth president of the United States, born at Kinderhook, Columbia co., New York; practised law at Hudson from 1809. He became a member of the United States Senate (1821), governor of the state of New York (1828), and secretary of state (1829). He was elected vice-president of the United States (1832), Jackson being president, which position he succeeded to (1837). The great monetary crisis of 1839, when many banks suspended payment, was attributed to the finance system of Jackson and Van Buren, so that the latter was easily defeated for the following presidency by General Harrison (1841). In 1848 he again stood, and divided the Democratic vote with Cass; but both were defeated by Zachary Taylor. Van Buren was a singularly able tactician in politics, which obtained him the title of the 'Little Magician.' He wrote *Inquiry into the Origin and Course of Political Parties in the United States* (1867). See Shepard's *Martin van Buren* (1888), and Bancroft's *Martin van Buren* (1889).

Vancouver, tn., British Columbia, 15 m. N. of Fraser R., is the western terminus of the Canadian Pacific Ry. Till 1885 its site was a dense forest. It has an opera house, public parks, a trade in timber, an excellent harbour, from which the Canadian Pacific steamers sail for Japan, China, and Australia. Pop. (1901) 26,135.

Vancouver, GEORGE (1758-98), British navigator, accompanied Cook on his voyages in 1772-4 and 1776-9. In 1791-2 he explored the north-west coast of America up to 56° N., also surveying southward as far as 35° N.

His account of the expedition appeared in 3 vols. (1798). Vancouver's name was given to the large island which he surveyed off the coast of British Columbia.

Vancouver Island, part of the Canadian province of British Columbia, lies on the Pacific coast between lat. 48° 19' N. and 50° 53' N. It is separated from the mainland by Queen Charlotte Sound, Johnston Strait, Strait of Georgia, and Strait of Juan de Fuca, which separates it from the United States. The surface of the island is hilly, and covered with dense forests, and the coasts are bold and rugged, being indented by many long, narrow, fiordlike harbours. The climate is very mild. The island is rich in minerals, and has valuable coal fields at Nanaimo and at Comox. There

Florence they were surrounded by the Romans under Stilicho and forced to surrender, and their king and 20,000 men perished. The rest of the horde poured into Gaul, and though the Vandals alone were defeated by the Franks, and lost 20,000 men again, yet, reinforced by the Suevi, Burgundians, and Alani, they overran Gaul, and committed all the excesses of barbaric devastation which have made their name proverbial. In 409 they passed into Spain, and in 422 took Seville and Carthage, and gave their name to Andalusia. On the invitation of the Roman Bonifacius, in 429 they invaded Africa under their king Genseric or Gaiseric. In Africa they took Hippo Regius in 431, and Carthage in 439; then, though com-



Vancouver Island.

are several sawmills. The fisheries also are valuable. Vancouver was discovered in 1592 by Juan de Fuca.

Vandals, a Germanic tribe, probably closely akin to the Goths. In history they first appear about 150 A.D., dwelling on the south coast of the Baltic and on the banks of the Oder. It was probably a southern division of the people, settled in Bohemia, who took part with the Quadi in the Marcomannic war in the time of Marcus Aurelius (167 to 175 A.D.). About 240 some of them joined the Goths in occupying, first the country N. of the Black Sea, and then the Roman province of Dacia. In 277 the Emperor Probus placed a colony of Vandals in Britain. In 405 they invaded Italy, under their king Radagaisus, along with the Alani, Burgundians, and Suevi. But whilst besieging

pelled to abandon the Mauritanian provinces, they ruled the coast from Tangier to Tripoli. Soon they built a fleet, ravaged Sicily, sacking Palermo, and in June 455 landed at the mouth of the Tiber, and plundered Rome from the 15th to the 29th of June. Practically all its treasures, including the golden table and candlestick from the temple at Jerusalem, were carried to Carthage, with thousands of captives. For years the Vandals continued to harry the Mediterranean coasts; they conquered the island of Sardinia, and, repulsing a Roman attack in 468, added Sicily to their rule. Their power was at its height when Genseric died (477). In his time the Vandals became Christian; but they were Arians, and fiercely persecuted orthodox believers and other heretics. In 533 the Byzantine general Belisarius landed

in Africa. The Vandals were several times defeated, and Carthage was entered on Sept. 15, 533; and in November of the same year they were routed in the decisive battle of Tricamaron. In the next year Africa, Sardinia, and Corsica were restored to the Roman empire. As a nation the Vandals soon ceased to exist.

Grouchy during the 'hundred days.' Exiled in 1816, he returned to France in 1824. See Du Casse's *Le Général Vandamme et sa Correspondance* (1870).

Vanderbilt, CORNELIUS (1794-1877), American financier, was born at New York. When a boy of sixteen he owned a ferry-boat between Staten Is. and the city.



A Painting by Van Dyck - George Digby, Earl of Bedford, and William, afterwards Duke of Bedford. In the Spencer Collection.

(Photo by Hanfstaengl.)

Vandamme, DOMINIQUE JOSEPH (1771-1830), French general, was born at Cassel (dep. Nord). He commanded under Napoleon in Germany, but was in 1813 forced by the Russians to surrender, with 10,000 men, at Kulm. After an imprisonment in Russia he returned to France, and commanded a corps under

In 1849 he established a line of steamers to California, and, during the Crimean war, to Havre. Towards the close of his life he became a 'railway king.' At his death he left an immense fortune (about a hundred million dollars). He had shortly before founded the Vanderbilt University at Nashville, and bestowed on it a million

dollars. — **WILLIAM HENRY**, his son (1821-85), born in New Brunswick, New Jersey, vastly extended his father's railroad schemes, and developed that system of government by individual capitalists which characterizes American undertakings. His eldest son, **CORNELIUS** (1843-99), and his second son, **WILLIAM KISSAM** (1849), have carried on the policy of the Vanderbilt system.

Vanderdecken. See **FLYING DUTCHMAN**.

Van der Goes, HUGO. See **GOES**.

Van der Poorten-Schwartz, J. M. W. See **MAARTENS**.

Van de Velde, WILLEM, THE ELDER (c. 1611-93), Dutch painter, born at Leyden. In early life he was a marine painter to the Dutch states, but in 1657 was appointed painter of sea-fights to King Charles II. of England, subsequently holding the same post under James II.

Van de Velde, WILLEM, THE YOUNGER (1633-1707). Dutch painter, was born at Amsterdam. He was appointed (1677) marine painter to Charles II., and won great fame. See Michel, *Les Van de Velde* (1892).

Van Diemen's Land. See **TASMANIA**.

Van Dyck, SIR ANTHONY (1599-1641), Flemish portrait painter, was born at Antwerp; entered Rubens's studio when about fifteen. When seventeen he had pupils of his own. From 1620-5 he travelled in Italy; on his return to Antwerp he became the chief court painter of his day, and during the next six years produced his finest historical and religious works, most of which are in Antwerp. Until he sojourned in Italy his style was closely modelled on that of Rubens; in the fine portraits of his Genoese period (two in Edinburgh) he developed a more restrained manner. Though Flemish by birth and training, he was influenced by the stately dignity of the Spanish grandee. In 1621 he painted for James I. in England, and in 1632 was appointed court-painter to Charles I., and knighted. He was always 'magnificently dressed, had a numerous and gallant equipage, and kept a good table.' England has the finest and largest collection of his portraits—mostly in private galleries. His influence on the development of the English school was great and lasting. His immediate pupils were: William Dobson (1610-46), Henry Stone (d. 1653), James Gandy, who worked in Ireland, and the Scottish painter George Jamesone. He was a remarkably fine etcher, as his portraits of Vorsterman, Snyder, and his own effigy testify. He also sketched in

grisaille the heads of eight illustrious men of his day, which were engraved and published, with certain additions, in 1645; and again, 124 plates in the edition of 1759. See *Van Dyck*, by Percy Rendall Head (1887).

Van Dyke, HENRY (1852), American author, born in Germantown, Pennsylvania, became pastor of the United Congregational Church in Newport, Rhode I., and later of the Brick Presbyterian Church, New York, whence he went to Princeton as professor of English literature (1900). He has written *The Reality of Religion* (1884), *Story of the Psalms* (1887), *The National Sin of Literary Piracy* (1888), *The Poetry of Tennyson* (1889), *Sermons to Young Men* (1893), *The Christ-Child in Art* (1899), *Little Rivers* (1895), *The Other Wise Man* (1896), *Fisherman's Luck* (1899), and *The Blue Flower* (1902).

Vane, SIR HENRY, THE ELDER (1589-1655), English secretary of state, born in Kent. In 1639 he was made treasurer of the royal household. He sat in Parliament for Lostwithiel (1614), Carlisle (1621-6), Retford (1628), and was sent to negotiate peace between Holland and Spain (1629-30), and to arrange terms with Gustavus Adolphus of Sweden (1631). He became secretary of state (1640). Being dismissed from office by Charles I., Vane joined the opposition (1641), and represented Kent in Cromwell's first Parliament. See Collins's *Life of Vane*, under title of *Earl of Darlington* (1812).

Vane, SIR HENRY, THE YOUNGER (1613-62), English author and statesman, was born at Hadlow in Kent. He became governor of Massachusetts (1636), but returned to England (1637), where he became joint treasurer of the navy (1639-41). He represented Hull in the Short Parliament, and was knighted (1640). Vane was a notable leader of the parliamentary party during the Long Parliament; was one of the commissioners who promoted the Solemn League and Covenant (1643); and succeeded Pym as leader in the House. With Cromwell he passed the 'accommodation order' (1644), but took no part in the execution of Charles. He was elected member of the Council of State (1649), was one of the commissioners who negotiated the union of England and Scotland (1652), and took a prominent part in the government of the commonwealth till 1653, when he retired into private life. For publishing *Healing Question* (1656) he was imprisoned for four months, but returned to Parliament after Cromwell's death (1658). After the restoration (1660) he was executed by Charles II. He was an able

speaker and a sound statesman. See *Life* by J. K. Hosmer (1888), and by W. W. Ireland (1905).

Van Erpen. See ERPENIUS.

Vanessa, a genus of butterflies belonging to the family Nymphalidae, and including some handsome and conspicuous species, often very abundant. The club of the antennæ is short and bold, and the eyes are extremely hairy. The British species are the Camberwell beauty (*V. antiopa*), the great tortoise-shell (*V. polychloros*), the common tortoise-shell (*V. urtica*), whose caterpillar is found on the nettle, the red admiral (*V. atalanta*), the painted lady (*V. cardui*), and the beautiful peacock (*V. io*), with its eyed wings.

Vane-Tempest-Stewart, C. S. See LONDONDERRY.

Van Eyck. See EYCK.

Van Helmont. See HELMONT.

Van Helst. See HELST.



Vanilla planifolia.

1. Fruit ('pod of vanilla.')

Vanilla, a genus of climbing tropical orchids, which bear thick leaves, and spikes or racemes of large flowers, not usually of much beauty. *V. phalænopstis*, a Madagascan species, with pale pinkish flowers, and *V. planifolia*, with green and white flowers, are sometimes grown in the stovehouse in a peaty border. The latter plant is the chief source of the vanilla of commerce.

Vanillin. See PERFUMERY.

Vanini, LUCILIO, or JULIUS CÆSAR (1584-1619), Italian philosopher, born at Taurisano, near Naples; wandered through central Europe teaching; but the unorthodox character of his teaching, which had a pantheistic tendency, aroused the enmity of the Church, and after an un-

settled life he was cruelly executed. His works, which include *Amphitheatrum Eternæ Providentiæ* (1615) and *De Admirandis Naturæ . . . Arcanis* (1616), have been republished by Rousset (1842). See *Life*, in French, by Vaisse (1871), and, in Italian, by Palumbo (1878).

Vanité Fair, the first of modern 'society journals,' was founded in 1868 by Mr. Thomas Gibson Bowles. A peculiar pungency was imparted to its pages by the malicious but clever pen of Grenville Murray. A palpable hit was scored by *Vanité Fair* when it produced a caricature in colours of 'Dizzy,' done by M. Pellegriani. The drawing was signed 'Ape,' and caricatures of the political and social notabilities of the day bearing the same signature continued to appear each week. In 1872 'Ape' was succeeded by 'Spy'—Mr. Leslie Ward—who has drawn for *Vanité Fair* ever since. In 1905 Mr. Fletcher Robinson became editor, and the paper passed into the hands of Lord Northcliffe.

Vaniyambadi, munic. tn., Salem dist., Madras Presidency, India, on the Palar R., 38 m. s.w. of Vellore. Pop. (1901) 12,005.

Van Lennep. See LENNEP.

Vanloo, JEAN BAPTISTE (1684-1745), French artist, of Dutch extraction, was born at Aix. He acquired a high reputation as a portrait painter, and was admitted to the Academy in 1731. In 1735 he was professor of painting at Paris.—CHARLES ANDRÉ (1705-65), his younger brother, was also a painter. He was born at Nice, and painted for the king of Sardinia a number of pictures from Tasso. He became an Academician in 1735.

Vannes, quaint seap. tn., cap. of dep. Morbihan, France, at the mouth of the riv. Vannes, 28 m. E. of Lorient; has shipbuilding, oyster-fishing, and manufactures of ropes, woollen, linen and cotton goods, and leather. Among its buildings are the 13th-century cathedral, and the museum of Celtic and Gallo-Roman antiquities. Vannes was a favourite residence of the dukes of Brittany. Pop. (1901) 18,083.

Vannucci. See ANDREA D'AGNOLLO.

Vannucci. See PERUGINO.

Van Ostade. See OSTADE.

Vansittart, NICHOLAS, FIRST BARON BEXLEY (1766-1851), English politician, born in London. His pamphlets in support of Pitt led to his entering Parliament as member for Hastings (1796). He became chancellor of the Exchequer (1812-22), and in 1823 was created Baron Bexley, and appointed chancellor of the Duchy of Lancaster. See *Vansittart Papers* (MSS. in British Museum).



Some famous Cartoons from 'Vanity Fair.'

1. Lord Salisbury. 2. Lord Beaconsfield. 3. W. E. Gladstone. 4. J. Chamberlain. 5. Sir H. Campbell-Bannerman. 6. A. J. Balfour.
 (Reproduced by permission from the original prints in colours.)

Van't Hoff, JACOBUS HENRICUS (1852), Dutch chemist, was born at Rotterdam; was appointed teacher of chemistry in the veterinary college of Utrecht in 1876, in 1878 professor in Amsterdam, and finally, in 1896, professor of chemistry at Berlin. To Van't Hoff physical chemistry as a distinct branch largely owes its existence. In 1874 he enunciated his theory as to the disposition of the atoms of compounds in space—a theory which has been the means of the most far-reaching advances. This was followed by his investigation of the osmotic pressure of dissolved substances; his theory, that such bodies when in dilute solution are in a state closely corresponding to that of a gas, has been very fruitful in chemistry, in physics, and in physiology. He has published (all translated into English) *Chemistry in Space* (1891), *Studies in Chemical Dynamics* (1896), and *Lectures on Theoretical and Physical Chemistry* (1899); and, along with Ostwald, has edited the *Zeitschrift für Physikalische Chemie* (1887). In 1901 he was given the Nobel prize for chemistry. See Ernst Cohen's *Jacobus Henricus Van't Hoff* (1899).

Van Tromp. See TROMP.

Van Veen. See HEEMSKERK.

Vapereau, LOUIS GUSTAVE (1819-1906), French author, born at Orleans; went to Paris in 1852, and wrote his *Dictionnaire Universel des Contemporains* (1858), a standard work of reference in constant process of revision, which he followed up with a yearly publication, *L'Année Littéraire et Dramatique* (1859-69). In 1877 he became inspector-general of public instruction, publishing in the same year his *Dictionnaire Universel des Littératures*.

Vapour. See GASES AND VAPOURS.

Var, maritime dep. of S.E. France, between depts. Bouches-du-Rhône and Alpes-Maritimes. It covers an area of 2,333 sq. m. It is mountainous, with fertile valleys, and its coast is deeply indented. Wine, tobacco, and fruit are produced; and paper, silk, and soap are manufactured. Cap. Draguignan; chief place, Toulon. Pop. (1901) 326,384.

Varangians, or VARINGS, a name given by the Greeks and Slavs to the Northmen, or Scandinavian rovers, who in the 9th and 10th centuries sailed down the Dnieper and threatened Constantinople. The raids of the Varangians were stayed when Vladimir Christianized his subjects in 988. From the end of the 10th century till the capture of the city by the Turks in 1453 there was a bodyguard of Varangians at Constantinople. War-

riors from England enlisted in it after the Norman conquest. See Scott's *Count Robert of Paris*.

Varanidæ. See MONITOR.

Varberg, tn. and wat.-pl., Halmstad co., Sweden, on the Kattegat, 48 m. by rail S.E. of Gothenburg. By a treaty made here in 1343 Valdemar Atterdag of Denmark ceded Skåne, Halland, and Blekinge to Sweden. Pop. (1900) 6,019.

Varдар (anc. *Axius*), riv., Turkey, rising in the S. of the vilayet of Kossovo, and flowing past Usküb and Köprili to the Gulf of Saloniki. Length about 200 m.

Varðö, tn., Norwegian co., Finnmark, on island of same name, on N. of Varanger Fjord; exports fish, train-oil, and guano. Pop. (1900) 2,579.

Varennes, tn., dep. Meuse, France, 18 m. N.W. of Verdun; has manufactures of embroidery and tiles. On June 21, 1791, Louis XVI. and his family were captured here while trying to escape. Pop. (1901) 1,192.

Varese, tn. and autumn resort, Como prov., Lombardy, N. Italy, near Lake Varese, 30 m. N.W. of Milan; manufactures silk, leather, paper, and wine. Its church of St. Victor dates from the 7th century. Pop. (1901) 17,666.

Variable Stars are those which fluctuate in light to the extent of at least half a magnitude. They may be divided into five classes:—(1.) Temporary stars. (2.) Irregular variables, exhibiting changes amenable to no definite law. The typical example is η Carinæ, now fully eight magnitudes fainter than at its maximum in 1843, but still marked by a bright-line spectrum analogous to those of 'new' stars. P Cygni is a similar though less extreme case. Other irregular stars, such as Betelgeux, vary by less than a magnitude. (3.) Long-period variables, of which the best-known representative is Mira Ceti. About four hundred members of the class have been detected, their periods ranging between two years and about three months. Their spectra usually include bright lines, chiefly of hydrogen, near epochs of maximum, which recur with wide deviations from punctuality. (4.) Short-period variables, which are of three species, designated severally as Geminid, Cepheid, and Cluster variables. In Geminids, of which ζ Geminorum is the exemplar, the flow of light-change pursues a symmetrical curve, the times of increase and of decrease being equal. Some, notably β Lyræ, show two similar maxima, with intervening disparate minima. V Vulpeculæ, notwithstanding its long period of seventy-five days, conforms to this type. Cepheid variables resemble δ

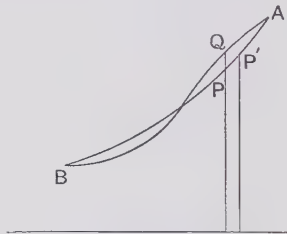
Cephei in rising to maximum in about one-third of the complete cycle. Cluster variables lie dormant during the greater part of periods, commonly only a few hours in length, then increase swiftly by one or two magnitudes, and sink more slowly to datum level. They occur rarely as isolated objects, but with profusion in certain clusters and nebulae. Short-period variables in general are extremely exact in their modes of change, which appear to be prescribed by the revolutions of companion bodies. (5.) Eclipsing stars are variable as a mere consequence of the geometrical relations of the systems formed by them. Their lustre would be constant if the planes of their revolutions were otherwise inclined. Some specimens, nevertheless, show phases so nearly continuous as to be scarcely distinguishable from those of fluctuating stars analogous to β Lyræ. Through comparisons of photographs taken at different epochs, crowds of variables have lately been discovered among faint stars. Thus, at Harvard College alone, the total number registered down to May 1906 exceeded 3,000, at least 1,000 of which are situated in the Magellanic clouds.

Variation. (1.) In biology, any deviation from type, whether as regards structure or function, seen in plants or animals. As soon as Darwin demonstrated the possibility of evolution, variation became of supreme importance. There are two main modes of scientifically studying variation. The first is by taking a very large number of individuals of a particular species and investigating these in detail as regards one special character. This is known as the statistical or actuarial method of study, and has been pursued with great energy in Britain, where it is associated with the names of Galton, Pearson, and Weldon. The second (or experimental) method consists in the breeding of organisms on a large scale, the variations which appear in the course of the experiment being studied for successive generations. De Vries abroad, and Bateson in Great Britain, are the outstanding exponents of this school. A modification of this method is the study of fossils through a definite period of geological time. This has been specially done by American zoologists. The statistical method seems to have definitely proved that if a single character be measured in a large number of individuals, it is possible to plot the results in the form of a curve, which is always of approximately symmetrical shape. It is from this fluctuating variabil-

ity, as it has been called, that new species arise by the action of natural selection. On the other hand, experimental breeding has shown that, in addition to this fluctuating variability, in certain organisms at least, another type exists—the chance variations or mutations of De Vries. In this case the organisms do not form a graduated series, but certain forms differ strikingly from the others, and these striking variations are stated to be constant from generation to generation. If such variations pass the test of natural selection—i.e. if they are fitted to survive—they may give rise to new types (species) in a very much shorter time than the fluctuating variations. This method of study is intimately connected with the laws of heredity laid down by Mendel. Weismann has especially interested himself in the problem of the cause of variation. The whole subject is one of great complexity; but most biologists are agreed that the immediate cause of variation is to be sought in the whole process of the mingling of two germ-plasmas in fertilization. (See EMBRYOLOGY.) See the journal *Biometrika* (1901, etc.), Bateson's *Study of Variation* (1894), De Vries's *Die Mutationstheorie* (1901-3) and *Species and Varieties* (1905), *Proc.* (Section D) *Brit. Assoc.* (1901 and 1904); also article HEREDITY. (2.) In music, a device in composition which consists in altering the melody or harmony of a simple theme so that at each repetition it appears in a new but still recognizable form. A theme and variations may be only a section of a work, as in sonatas, or may be an individual composition complete in itself, in which case the last variation is usually in the form of a more or less brilliant coda.

Variations, CALCULUS OF. The principles underlying this difficult branch of mathematics may be illustrated by the following special case. Let there be two points not in the same vertical line, and let it be required to find the curve down which a body will slide in the least time. There must evidently be a curve down which the body will slide in a time that is at least not longer than the time down any other curve. Let APB represent this curve of shortest time—this brachistochronic path, as it is called—and let AQB be any neighbouring curve, Q being vertically above P. We can evidently pass to the curve AQB from the curve APB by varying the height of each point. This is clearly a kind of differentiation (see CALCULUS); but it is not a differentiation of the usual kind, such as the variation in the height of P would be

if the transition were to P', a neighbouring point on the same curve. Hence to distinguish it from differentiation along a curve we call it a variation from one curve to another. Now if APB is the path of shortest time, the quantity which expresses this time must be increased when we pass by variation to any neighbouring curve. The problem to be solved is then to find the form of the curve APB such that any change in the form will increase the time of sliding down it. The calculus of variations supplies methods for effecting the solution. Mathematically similar are the so-called isoperimetrical problems, of which the following may be taken as examples. To find the form of a curve of given length which will enclose the greatest area. The curve is the circle when no further conditions are given. But we may limit the positions of the ends of the given length of line in a great variety



Calculus of Variations.

of ways (e.g. that they must lie on a particular curve or system of lines), and then the problem demands a new solution. Another class of isoperimetrical problem is that suggested by soap films, which always adjust their form so as to fulfil certain boundary conditions and have the area of film a minimum. See Woodhouse's *Isoperimetrical Problems* (1810), a most suggestive book; Jellett's *Calculus of Variations* (1850); and Todhunter's *History of the Calculus of Variations* (1861).

Varicella. See CHICKEN-POX.

Varicose Veins are veins increased in length, in calibre, and at first in the thickness of the vessel walls. In severe cases they become tortuous, knotted, and finally thin-walled. Almost any impediment to the circulation predisposes to varix, and occupations which necessitate prolonged standing are extremely conducive to the condition. The veins most apt to be affected are those of the lower limbs—those of the rectum producing hæmorrhoids, and those of the spermatic cord producing varicocele. In the leg the condition is most manifest in the superficial veins. Varicosity

is apt to be progressive, and may be a source of grave danger. The subject of varicose veins should, if possible, be relieved from an occupation which necessitates the erect position for continued periods. Support should be given to the affected vein by elastic bandages or stockings. Varicocele may be removed by a surgical operation, which is generally successful.

Variola. See SMALLPOX.

Varius, LUCIUS (c. 74-14 B.C.), a Roman poet of the Augustan age, a contemporary and friend of Horace and Virgil. Though he was considered one of the greatest poets of his time, scarcely anything is known of his life or his writings. He wrote epic poems, celebrating both Julius Cæsar and Augustus; and his tragedy, *Thyestes*, was called by Quintilian 'comparable to any Greek drama.' He was one of Virgil's literary executors, and revised the *Æneid* before its publication.

Varley, CORNELIUS (1781-1873), English water-colour painter and inventor, brother of John and William Fleetwood Varley. He invented lenses and the graphic telescope (1811), exhibited at the Royal Academy (1803-59), was one of the founders of the Water-colour Society (1804), and wrote various scientific papers.

Varley, CROMWELL FLEETWOOD (1828-83), English electrical engineer, son of Cornelius Varley. He invented a double-current key and relay (1854), and a cymaphen, an instrument resembling the telephone (1870). After the failure of the first Atlantic cable (1858), Varley contributed greatly to the success of the second.

Varley, JOHN (1778-1842), English water-colour painter, born at Hackney, London. He first exhibited at the Royal Academy, but in 1804 he became a foundation member of the Water-colour Society. As a teacher he was peculiarly successful; he counted W. H. Hunt and Linnell among his pupils. His composition was masterly, and his best work has great freshness and breadth. Examples of his drawings are in the National and the Tate Gallery, London, and in S. Kensington Museum.

Varley, WILLIAM FLEETWOOD (1785-1856), English artist, younger brother of Cornelius and John Varley. He exhibited landscapes at the Royal Academy (1804-18), and taught in Cornwall, Bath, and Oxford. He wrote *Observations on Colouring and Sketching from Nature* (1820).

Varna, fort. sept. tn., Bulgaria, on Black Sea, 300 m. N.E. of Sofia; seat of a Greek and a Bulgarian metropolitan. It exports cattle, butter, skins, and grain. The total trade is valued

at over one million sterling. Here (Nov. 10, 1444) Ladislaus, king of Hungary and Poland, was defeated and slain by the Turks. Pop. (1900) 33,443.

Varnhagen von Ense, KARL AUGUST (1785-1858), German author, was born at Düsseldorf; served in the Austrian army against Napoleon (1809); joined the Russian army (1813); subsequently did valuable work at Carlsruhe, and later at Berlin, in the Prussian diplomatic service. It is as a biographer that he was most successful. Among his works are *Deutsche Erzählungen* (1815); *Goethe in den Zeugnissen der Mitlebenden* (1823); *Biographische Denkmale* (1824-30; later ed. 1872); and *Karl Müller's Leben und Kleine Schriften* (1847). The letters addressed to him by A. von Humboldt (1860) and Carlyle (1892) have also been published.

Varnhagen von Ense, RAHEL ANTONIE FRIEDERIKE (1771-1883), wife of the preceding, was a Christianized Jewess (*née* Levin). Her remarkable gifts made her a power in Berlin literary circles. Her literary remains were published in 1833 and 1836, and some of her correspondence in 1861 and 1874-5. See Schmidt-Weissenfels's *Rahel und ihre Zeit* (1857), and L. Assing's *Aus Rahels Herzensleben* (1877).

Varnishes. The drying oils, such as linseed oil, are natural varnishes, the drying power being increased by various processes, such as boiling. If a resinous substance is dissolved by heat in the drying oil, more hardness is given to the varnish, but this addition necessitates diluting the varnish with oil of turpentine. Varnishes which consist of resinous material dissolved in oil of turpentine are often called 'crystal varnishes,' and are used chiefly for varnishing maps. For 'spirit varnishes' ordinary methylated spirit is generally used, but absolute alcohol is preferable. In making spirit varnishes the resinous material is placed in a bottle, together with about its own bulk of clean and dry flint stones or broken glass. The spirit is poured in and the bottle shaken occasionally until solution is complete, when the varnish is filtered.

Varnish Tree, a name sometimes given to *Ailantus glandulosa*, the tree of heaven, a native of China; also applied to *Rhus vernicifera* and other trees.

Varro. (1.) GAIUS TERENTIUS VARRO was consul at ancient Rome in 216 B.C., when he fought the disastrous battle of Cannæ against Hannibal. He afterwards acted on embassies to Philip of Macedon in 203, and Syphax, king in Numidia, in 200 B.C. **(2.) MARCUS TERENTIUS VARRO** (116-28 B.C.), the most famous of the Ro-

mans for learning, was born at Reate. He was pro-prætor under Pompey in his war against the pirates; and in the civil war between Pompey and Cæsar he commanded troops for Pompey in Spain; after Pharsalia he surrendered to Cæsar, who made him superintendent of the public library which he was preparing. He was proscribed by the second triumvirate, but succeeded in hiding himself. He passed the rest of his life in tranquil study. His most important works were satires (in the style of Menippus), mock tragedies, poems, and *Antiquitates Rerum Humanarum et Divinarum*, which was much used by St. Augustine in his *De Civitate Dei*. Other books were *Imagines* (or portraits) of 700 Greek and Roman celebrities; *Disciplina*, a sort of encyclopædia of the liberal arts; *De Lingua Latina*, mutilated; and *De Re Rustica*, almost entire. His style is vigorous, though often stiff and abrupt, and lacking in finish. There is an edition of *De Re Rustica* by Keil (1891), of *De Lingua Latina* by Spengel (1885), and of the fragments by Brunetti (1874).

Varuna, a term originally used in Vedic literature to express the firmament. Subsequently Hinduism deified Varuna as sovereign of all waters. Varuna's *sakti*, or female counterpart, is Varuni, goddess of wine.

Varus. (1.) PUBLIUS ATIUS VARUS, one of Pompey's generals in the civil war against Cæsar. When Pompey left Italy in 49 B.C., Varus crossed to Africa, there raised troops, and, with the assistance of Juba, destroyed Curio's army. After Pharsalia, in 48, Varus had to resign the command in Africa to Scipio; and after the defeat of the Pompeians in Africa at Thapsus, he joined Pompey's sons in Spain, and fell at the battle of Munda (45). **(2.) PUBLIUS QUINTILIUS VARUS** was consul at Rome in 13 B.C.; afterwards governor of Syria, and about 7 A.D. was made governor of Germany. His ill-considered measures led to a revolt of the Germans under Arminius, and being entrapped in the Teutoburger Forest, after three days of fighting and heavy losses, his legions were annihilated (9 A.D.) and Varus killed himself.

Vasa, GUSTAVUS. See GUSTAVUS I.

Vasa. See NIKOLAISTAD.

Vásárhely. See MAROS VÁSÁRHELY.

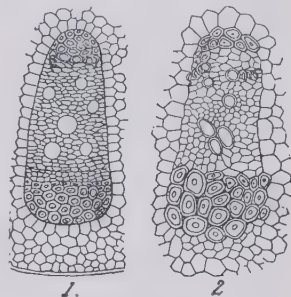
Vásárhelyi Hodmező. See HÓD-MEZŐ-VÁSÁRHELY.

Vasari, GIORGIO (1511-74), Italian art historian, architect, and painter, was born at Arezzo; commissioned by Duke Cosimo the Great (1553) to execute nu-

merous works of art at Florence. Examples of his painting at Rome, Bologna, Arezzo, and Rimini are not altogether pleasing; but specimens of his architecture at Rome, Florence, Arezzo, Pistoja, and Pisa testify to brilliant gifts. However, Vasari's fame rests chiefly on the *Vite de' più eccellenti Pittori, Scultori, e Architetti* (1550; 2nd ed., greatly improved, 1568; the best of the subsequent editions is that of Milanesi, 9 vols., 1878-85). This work is the basis of Italian art history, and can never lose its value. The best English version is still that of Mrs. J. Foster (in Bohn's Library), with the commentary of J. P. Richter.

Vasco da Gama. See GAMA.

Vasconcellos, JOAQUIM ANTONIO DA FONSECA (1849), Portuguese critic, born at Oporto; became (1883) professor of German at the Lyceum there, and has published *Portuguese Musicians* (1870), *Goethe's 'Faust,' and Castilho's Translation* (1872), *Albert Dürer and his Influence* (1879), and *Goësiana* (1879-97).



Vascular System in Plants.

1. Fibro-vascular bundle of melon (exogenous).
2. Fibro-vascular bundle of palm (endogenous).

Vascular System, in plants. In flowering plants, and also in certain flowerless plants belonging to the sections of the ferns and club mosses known as vascular cryptogams, fluids containing nourishment are largely distributed to all parts of the plant by means of certain tubes collected in bundles, known as fibro-vascular bundles.

Vaseline, soft paraffin, or petroleum jelly, is the pasty mixture of hydrocarbons left on the distillation of American petroleum or of ozokerite; an inferior product is made by dissolving solid paraffins in heavy oils. It is purified mainly by filtration through animal charcoal. It is odourless and semi-solid, melts at from 40° to 50° C., and is insoluble in water, but dissolves freely in benzene, turpentine, etc. It is but slightly acted on by acids or alkalis, and does not turn rancid. It is

largely used as a lubricant, as a protective for polished iron, etc., and in pharmacy as an unguent and a basis for ointments.

Vases, the more elegant species of glazed or enamelled earthenware manufactured by the ancient Assyrians, Egyptians, Romans, Etruscans, and Greeks, as well as by mediæval artists. Greek painted vases belong to a period between 700 and 200 B.C. These vases were given as rewards in the pan-Athenaic festivals. The enamelled vases of Persia stand midway, in point of technique, between earthenware and true porcelain. The art appears to have been lost for many centuries, as it is only in the 11th century that the white-glazed vases of the European continent become conspicuous. There is in the Alhambra an amphora-shaped vase, called 'La Jarra,' over four feet in height, ornamented with scrolls and Arabic inscriptions. The golden vase of Valencia is probably a 15th-century work. A vase of perhaps unique beauty and workmanship, known as the 'Cellini ewer,' was formerly among the crown jewels of France. See also POTTERY, GLASS, and PORTLAND VASE.

Vasilkov, tn., Kiev gov., S.W. Russia, 24 m. S.W. of Kiev city; with breweries, brick works, and manufacture of tobacco, candles, and soap. Pop. (1897) 17,824.

Vasto (anc. *Histonium*), tn., Chieti prov., Abruzzi e Molise, Italy, near Adriatic, 30 m. E.S.E. of Chieti; has manufactures of wine, wax candles, and bricks. There is a Gothic cathedral. Pop. (1901) 15,542.

Vatican, the palace of the popes at Rome, stands on the N. side of the Tiber, in what is known as the Leonine city. Its original nucleus seems to have been a house built in the time of Constantine, rebuilt by Pope Innocent III. about 1200, and enlarged by Nicholas III. (1277-80). The popes did not habitually occupy it, however, until after the return from Avignon (1377). The palace was almost entirely rebuilt on a much grander scale from 1447. Only a relatively small portion of the existing vast complex is inhabited by the pope. The rest includes the Sistine Chapel (1473 onwards), decorated with paintings by the chief artists of the Florentine and Umbrian schools in 1481-3, while the ceiling exhibits some of the grandest work done (1508-12) by Michael Angelo, and his *Last Judgment* (1534-41) adorns the altar; Raphael's stanze (1508-20)—that is, frescoes in the state rooms, and loggie or arcades, in great part actually executed by his pupils; the picture gal-

lery, containing pictures by Leonardo da Vinci, Raphael, Fra Angelico, Domenichino, Titian, Perugino, and others; the chapel of Nicholas V., adorned with frescoes (1450-5) by Fra Angelico; 'Raphael's carpets,' for which he drew the designs in 1515-16; the Borgian apartments, with frescoes by Pinturicchio and others; the Pius-Clementine Museum, containing famous sculptures of ancient Greece, including the Laocoon group and the Apollo Belvedere; the Chiaramonti Museum, also antique sculptures; the Braccio Nuovo, containing portraits, statues, and busts, Greek and Roman; the Egyptian Museum; the Etruscan Museum, founded by Gregory XVI. in 1836, of especial value; the Museum of Christian Antiquities, containing many objects from the catacombs and many ancient ecclesiastical and liturgical articles; and the library, containing nearly 30,000 MSS.

Vatican Council. This council was summoned to proclaim the infallibility of the pope. It met on Dec. 8, 1869, and, being adjourned, reassembled on July 18, 1870. The Ultramontanes triumphed after a keen debate, the 'Old Catholics' alone finally dissenting from the dogma, and repudiating the general character of the council. See Gladstone's *Vatican Decrees* (1874), and Manning's *True Story of the Vatican Council* (1877).

Vatinius, PUBLIUS, a Roman who was quaestor in 63, and in 59 as tribune greatly assisted Cæsar in his democratic legislation. In 55 he was prætor; he served under Cæsar in the civil war, and was made consul in 47. In 46 he carried on war successfully in Illyricum against the Pompeian forces, but early in 43 had to surrender Dyrrachium and his army to Brutus. Cicero delivered orations against him and for him; the former is extant.

Vatke, WILHELM (1806-82), German theologian and critic, born at Behndorf, near Magdeburg; became professor of theology at Berlin (1837). He was one of the earliest of the Old Testament critics to elucidate the theory of the post-exilic origin of the priestly code in the Pentateuch, which has been elaborated by Kuenen and Wellhausen. His principal works were *Die Religion des Alten Testaments* (1835), *Historisch-kritische Einleitung in das Alte Testament* (1886), and *Religions-Philosophie* (1888).

Vatna - Jökull, or KLOFA-JÖKULL, a volcanic mt. in S.E. Iceland, rising to nearly 6,000 ft. It was active in 1389 and 1753.

Vattel, EMERIC DE (1714-67), Swiss jurist, born near Neuchâtel.

Entering the state service of Saxony, he was sent to Bern as minister of the elector. Among his chief works are *Loisirs Philosophiques* (1747); *Mélanges de Littérature, de Morale et de Politique* (1757); and his masterpiece, *Droit des Gens, ou Principes de la Loi Naturelle* (1758). His final work was *Cours de Droit Naturel* (1862).

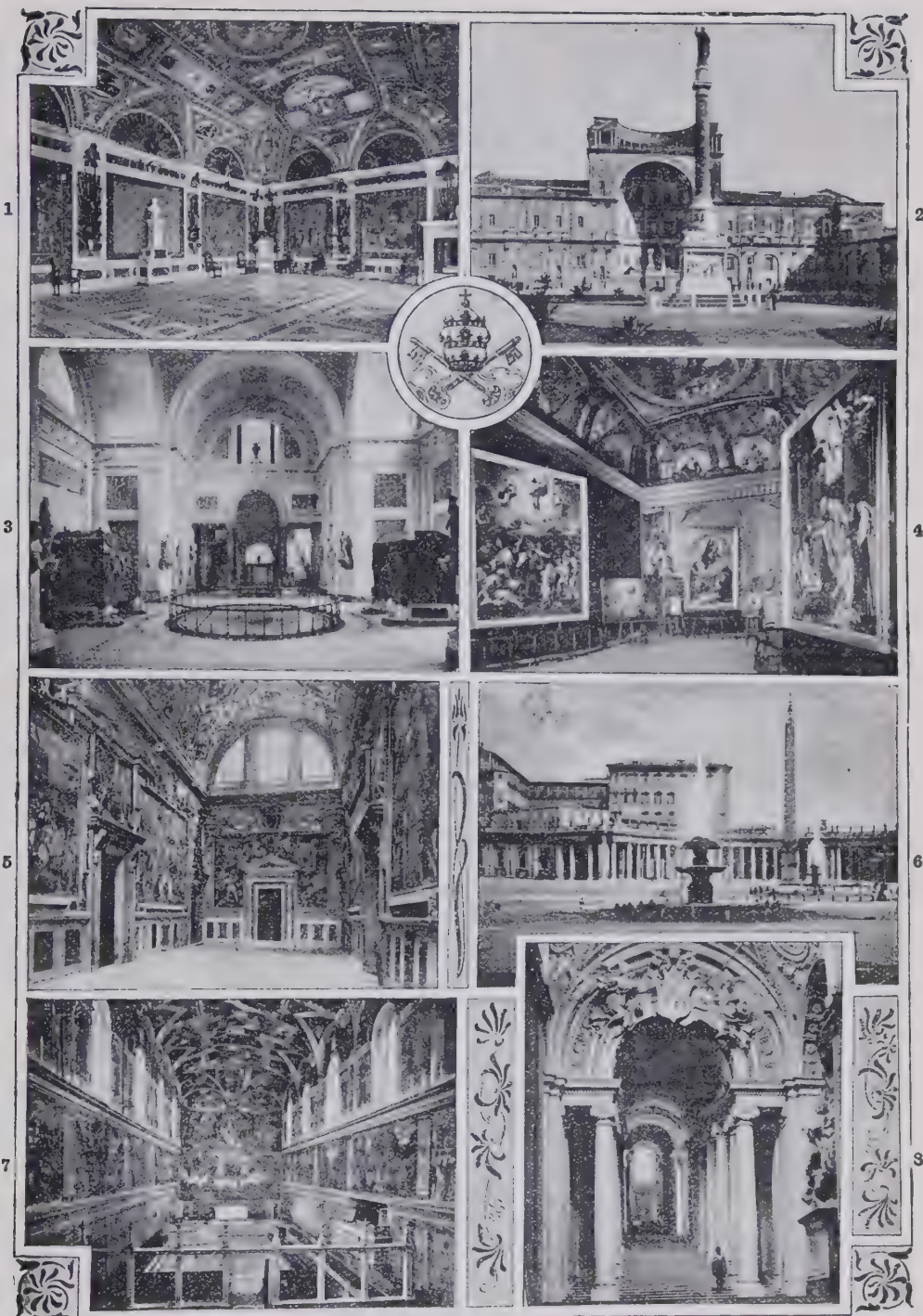
Vauban, SÉBASTIEN LE PRÉSTRE DE (1633-1707), marshal of France, born at Saint-Léger de Foucher in Burgundy. He entered the army of Condé in the Spanish service, and distinguished himself by his daring and his knowledge of military engineering. Taken prisoner by the French, he was induced by Mazarin to serve their country. His life was passed mainly in making and besieging fortresses. He also directed or reported on operations connected with harbours and inland navigation. He was created a marshal of France (1703). He wrote *Traité de l'Attaque et de la Défense des Places* (1739), *Essai sur les Fortifications* (1739), and *Traité des Sièges* (1747); also *Mémoires Inédits sur Landau et Luxembourg* (1841), *Oisivetés de M. de Vauban* (1843-6), *Projet d'une Dîme Royale* (1707), which was condemned by Parliament, and procured its author's disgrace. See Michel's *Histoire de Vauban* (1879).

Vaucluse, dep. of S.E. France, between dep. Drôme on N. and dep. Bouches-du-Rhône on S.; covers an area of 1,381 sq. m., and is watered by tributaries of the Rhone and Durance. Agriculture is the chief industry; wine is produced; and paper, linen goods, silk, and chemicals are manufactured. The capital is Avignon. Petrarch lived for sixteen years at Vaucluse, 15 m. E. of Avignon, composing many of his finest poems to Laura, and writing or beginning most of his other works. Pop. (1901) 236,949.

Vaud (Ger. *Waadt*), Swiss canton, with an area of 1,244 sq. m. and pop. (1900) 284,673, mainly French-speaking and Protestant. It did not become a full canton till 1803. It includes all the N. shore of the Lake of Geneva, and extends from the French frontier in the Jura to the Bernese Oberland. Its chief product is wine, and its capital is Lausanne.

Vaudeville, a minor song of a gay order, suitable to be carolled to a popular air. Street songs and musical quips come under this category. In drama the vaudeville is something light and amusing, or of the nature of comic opera. Olivier Basselin, in the 15th century, originated the word, by which he described his songs composed in the valley of the Vire.

Vaudois. See WALDENSES.



Views in the Vatican.

1. Gallery of the Popes. 2. Court of the Pine. 3. Gallery of the Greek Cross. 4. Gallery of the Transfiguration. 5. Ducal Gallery.
6. Exterior, with fountains. 7. Sistine Chapel. 8. Scala Regia.

Vaughan, HENRY (1622-95), the 'Silurist,' Welsh poet, was born at Llansaintffraed, Brecknockshire, in the ancient territory of the Silures. His twin-brother, Thomas (1622-65), became known as an alchemist under the name of Eugenius Philalethes. Henry studied the law, and settled down as a physician at Brecon. As a young man he had written secular verse after the style of Donne and Ben Jonson; in his later years he wrote religious verse in that of George Herbert. His works include *Poems* (1646); *Silex Scintillans* (1650; ed. Bettany, 1905); *Thalia Rediviva* (1678); *Sacred Poems* (ed. H. F. Lyte, 1847); *Collected Poems* (ed. E. K. Chambers, 1896, and E. Hutton, 1904); and in prose, *Mount of Olives* (1652); *Flores Solitudinis* (1654); *Hermetical Physic* (1655); *Collected Works* (ed. A. B. Grosart, 1871); *Selections* (ed. W. R. Nicoll; ed. J. R. Tutin, 1893).

Vaughan, HERBERT (1832-1903), cardinal, Roman Catholic archbishop of Westminster, was born at Gloucester. He was bishop of Salford from 1872 to 1892, when he was promoted to the archiepiscopal see. The principal event of his occupancy of the chair was the erection of the cathedral at Westminster. He was Ultramontane in his views.

Vaughan, ROBERT (1795-1868), Welsh Congregationalist divine; became minister of Worcester (1819); Horton Street, Kensington (1825); professor of history at University College, London (1834); and president and professor of theology, Lancashire Independent College (1843). He founded the *British Quarterly* (1845), and wrote *Life and Opinions of John de Wycliffe* (1828), and *Revolutions in English History* (1859-63). See *Robert Vaughan: a Memorial* (1869).

Vault, an arched ceiling or roof, composed of brick or other material resisting compression, the stress produced being supported by abutments. A vault in cross section may follow any form of the arch, and is termed a barrel (semicircular) or tunnel vault when continuous without intersections. Vaulting was not used in important buildings till Roman times, but passages six feet wide covered with barrel vaults, built in crude brick, were discovered by Professor Flinders Petrie at Dendera in Egypt, dating from 3500 B.C. The mitres or intersections of vaults are termed groins, which in a barrel vault take the form of an ellipse, a difficult construction. The further difficulty of intersecting vaults of different spans gave rise to the common use of the Pointed arch form and the groined rib; the

spandrels, web, or shell of the vault was then built of tufa, or other light stone, between the ribs, and supported by them. In the Pointed style the development of the ribbed vault is important, and is distinguished as hexapartite, quadripartite, fan tracery, etc. Vaults may also be in the form of a dome or a cone, the latter being used when a load has to be supported on the top conveying the thrust direct to the supports, as inside the timber dome of St. Paul's.

Vauvenargues, LUC DE CLAPIERS, MARQUIS DE (1715-47), French philosopher, born at Aix in Provence; served in the Italian campaign (1733-6) and that in Bohemia (1741-3), after which he turned his attention to literature, making Paris his residence, and becoming the friend of Mirabeau, Voltaire, and Marmontel. He achieved immediate fame with his first book, *Introduction à la Connaissance de l'Esprit Humain* (1746). His *Euvres Complètes* have been edited by Gilbert (1857) and by Plon (1874). See Paléologue's *Vauvenargues* (1890).

Vauxhall, a once famous and fashionable public garden at Lambeth, London, was opened in 1660, and existed till 1859.

Vavassour, or **VAVASSOR**, a feudal term indicating a chief vassal, holding not immediately from the lord paramount, but from a principal lord, and having other vassals who held from him.

V.C., Victoria Cross; Vice-chancellor; Vice-consul.

V.D., Volunteer Officers' Decoration.

Vecellio. See **TITIAN**.

Vector, in mathematics, the name given to any quantity which involves direction as well as magnitude. The simplest example is the position of one point with respect to another, obviously fully represented by the straight line joining them. Other vector quantities are velocity, force, moment of force, angular momentum, electric induction, and magnetic induction. Each of these can be represented by a straight line of appropriate length and suitable direction. Hamilton's quaternions contain the most complete system of vector algebra suitable for applications in geometry, dynamics, and electric theory. The methods there developed have been introduced by later writers in variously modified forms. See Henrici's *Vectors and Rotors* (1903), Wilson and Gibbs's *Vector Analysis* (1901), Kelland and Tait's *Quaternions* (3rd ed. 1904).

Vedanta, or **UTTARA-MIMAMSA**, or **UPANISHAD**, a system of Vedic or ancient Hindu philosophy, the object of which is an inquiry into

the true nature of the human soul. Amongst its conclusions are these: that the individuality of the soul is only an illusion (*maya*), and its seeming experience is fictitious; that there is but one reality—the supreme spirit; that redemption from the manifold pains of the unending succession of states of existence imposed by metempsychosis is to be won by 'purified' knowledge and by the reunion of the impersonal soul with the supreme spirit (Brahman). Its most famous interpreters were Sankara-Acharya, who lived in the 9th century A.D., and Ramanuja, of the 12th century. See Deussen's *Die Sutras des Vedanta* (1887) and the English trans. by G. Thibaut in vols. xxxiv. xxxviii. and xlviii. (1892-1904) of *Sacred Books of the East*.

Vedas, the oldest sacred literature of the Hindus, are written in Sanskrit, and are supposed to have been composed by a succession of poets from about 1500 to 1000 B.C. They are divided into four parts—*Rig-Veda*, *Yajur-Veda*, *Sâma-Veda*, and *Atharva-Veda*. Of these the stateliest, and probably the oldest, is the *Rig-Veda*, songs in praise of personified elements, and from it the other three appear to have largely borrowed. The *Yajur-Veda* are sacrificial prayers; the *Sâma-Veda*, hymns and tunes sung at the Soma sacrificial rites; and the *Atharvâ-Veda*, undoubtedly the most modern, contains incantations to be used against the powers of evil. These poems embody the earliest religious conceptions of the Hindus, and throw some light on the ancient history and social condition of the Indo-Aryan race. The Vedic bards appeal to nature and to homely joys, singing of gracious sunshine, the rage of storm, treasures of the prodigal earth, the herds of cattle, music of the birds. Each of these great collections of ancient hymns is accompanied by a commentary in prose called a Brahmana. See **SANSKRIT LANGUAGE AND LITERATURE**; also Arnold's *Vedic Metre* (1905).

Veddahs, a tribe of Ceylon, the last survivors of the aborigines, representing the Yakkos of Sanskrit writings; with very long and high skull, long shaggy black hair, low stature (mean, 5 ft. 2 in.), and dark-brown colour, but features in other respects somewhat regular. They all speak a pure Sinhalese dialect, unaffected by Sanskrit or Pali elements. The population increased from 2,000 in 1871 to 3,970 in 1901.

Vedder, ELIHU (1836), American painter, born in New York city, but has made Paris his residence. Among his best-known paintings are *The Greek Actor's*

Daughter, Roman Girls on the Seashore, Venetians on the Main, The Lair of the Sea Serpent, and The Crucifixion. His illustrations of Fitzgerald's *Omar Khayyam* (1884) gained him a world-wide reputation.

Vedism, a term applied, in Hindu literature, to the revelations communicated by a self-existent Being to certain holy men (called Rishis) for the instruction of mankind. The Vedas are the written expression of these utterances. Vedism, from which sprang Brahmanism, and through it Hinduism, was the earliest faith of the Hindu Aryan.

Veen, MAERTEN VAN. See HEEMSKERK.

Vega (a Lyræ), a Sirian star which will be the pole star of the 15th and 16th millenniums A.D., as it was of the 12th and 13th B.C. Vega has a parallax of .082", equivalent to a light-journey of nearly forty years. It is of ninety-two times the solar brilliancy.

Vega, GARCILASO DE LA (1503-36), Spanish poet, and favourite of the Emperor Charles V., in whose wars he fought all his life. He was killed in the storming of Muy. Much of his time was passed in Italy, and with his friend Boscan he introduced into Spanish poetry the new note of the Italian renaissance. His Petrarchian sonnets are the finest in the Spanish language. His eclogues, in imitation of Virgil, have the sweet melancholy of his master with the added nobleness of Spanish thought. He was the first to popularize the Italian sonnet in Spain, and the first to write an ode in Spanish. Garcilaso's poetry was translated into English by J. H. Wiffen (1823). The first Spanish edition (with Boscan's poems included) was in 1543. See Croce's *Garcilaso de la Vega in Italia* (1894).

Vega, GARCILASO INCA DE LA (1540-1616), historian of Peru, born at Cuzco. He went to Spain (1560), and served in the Spanish army; but afterwards settled in Cordova, where he devoted himself to historical writing, producing, among other works, *El Florida del Inca* (1605), a vivid and accurate description of De Soto's expedition to Florida; and *Historia General del Perú* (1609-16; Eng. trans. 1869).

Vega Carpio, LOPE FELIX DE. See LOPE.

Vegetable Ivory. See IVORY.

Vegetable Marrow (*Cucurbita Pepo ovifera*), an annual trailing plant of the gourd order, largely grown in Britain for its fruits, which are eaten as a vegetable, and are also used in the form of sweet preserves. The seed is best sown singly in small pots in April, in moderate heat. The young plants should gradually be hard-

ened, and early in June should be transferred to the open. A heap of well-decayed rubbish, mixed with loam, makes an admirable bed. Plenty of water should be given during the whole period of growth.



Vegetable Marrow.

1, Male flower, section; 2, pistil of female flower.

Vegetable Physiology. See PLANTS, PHYSIOLOGY OF.

Vegetarianism. Of vegetarians, some reject all animal foods (even eggs, milk, and butter); others abstain only from foods whose production involves the destruction of living animals; while a third group consists of those who allow themselves such foods as are procurable without unnecessary suffering or pain—e.g. net-caught fish. Extremists state that flesh diet is not only dearer, less healthy, more wasteful, and more cruel than vegetable feeding, but is more apt to produce ferocity, as contrasted with the humanity and gentleness supposed to be fostered by fruitarianism or vegetarianism. Vegetables are, however, so overloaded with starch and cellulose that they are less assimilable than flesh. For this reason 17 per cent. of vegetable albuminates escape digestion, as compared with only 3 per cent. of flesh albuminates. Further, in order to get a sufficient quantity of albuminates from a purely vegetable diet, man must eat a quantity of starch far in excess of his needs—in excess, indeed, of his power of starch assimilation. Moreover, man's intestinal organs and teeth are adapted to a mixed diet. A very formidable indictment is brought against an exclusively vegetable diet as a producer of premature senility and calcareous degeneration of the arteries. In a proper dietary the animal food should seldom exceed one-fourth of the whole.

Vehmgericht, or FEMGERICHT, an institution of justice, of which a one-sided view is generally held,

based on Scott's *Anne of Geierstein*. In its later days the tribunal became subject to many abuses, and was therefore regulated and restricted to its original district of Westphalia by the Emperor Maximilian. But in its origin it was a free, popular, public court of justice, which continued old German ideas of popular law and custom. It was in no sense a secret society, although it might, and sometimes did, hold secret sittings. But any free-born German could become a member, and in any case the membership was too large to admit of secrecy. The judicial procedure was exactly the same as in ordinary courts, except that torture was not used. On conviction, however, punishment was summary, and a dagger marked with the letters S.S.G.G. (supposed to stand for words meaning rope, stone, grass, green), was left beside the body, that there might be no mistake as to the cause of death. The jurisdiction of the tribunal at one time extended far beyond Westphalia, and princes and nobles found it convenient to become *Schöffen* (members). It was finally abolished by Jerome Bonaparte in 1811. See Wigand's *Das Femgericht Westphalens* (ed. 1893), and Lindner's *Die Feme* (1887).

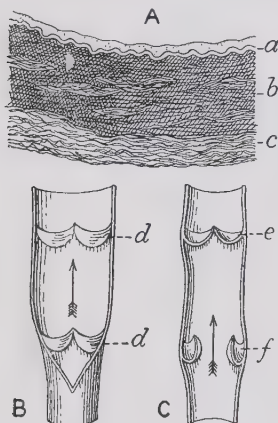
Veii, an ancient Etruscan city, situated 12 m. N.W. of Rome. It was one of the twelve cities of the Etruscan confederacy. Frequent wars were waged by Rome with Veii during three and a half centuries, and ended in the capture of Veii by Camillus in 396 B.C., after a siege said to have lasted ten years. When the Gauls captured Rome in 390, the Romans took shelter at Veii. See Dennis's *Cities and Cemeteries of Etruria* (1878).

Veiled Prophet. See AL-HAKIM-IBN-OTTO.

Veins, in anatomy, are elastic tubes by which blood is borne from the periphery towards the heart. They are distinguished as systemic, pulmonary, or portal. Pulmonary veins carry oxygenated blood from the lungs; systemic veins carry venous blood from the tissues; the portal vein conveys blood laden with food products from the alimentary canal to the liver, in which it ramifies like an artery. In structure a vein resembles an artery in having three coats, but its walls are thinner and less elastic. Venous blood-pressure is comparatively low, and the current is continuous, no pulse being present except under abnormal conditions. For diseases of veins see PHLEBITIS, THROMBOSIS, VARICOSE VEINS.

Veins, in geology. See DYKES, LODES.

Veit, PHILIPP (1793-1877), German painter, born in Berlin. He studied art in Rome, and became director of the Stadel Institute at Frankfurt-on-Main (1830) and of the museum at Mainz (1853). Among his works are *The Two Marias at the Sepulchre*, *The Assumption*, *The Good Samaritan*, *Christianity bringing the Fine Arts to Germany*, and *The Glorification of the Christian Faith* (for the cathedral of Berlin).



Veins.

A. Transverse section of wall of a vein. B. Vein laid open, showing valves. C. Section of vein, with valves open and closed. a, Inner coat (epithelial and subepithelial layers); b, middle coat (muscular tissue); c, external coat (areolar tissue and elastic fibres); d, two pairs of valves; e, valves closed; f, valves open.

Veitch, JOHN (1829-94), Scottish philosopher and historian, was born at Peebles. He was assistant to Sir William Hamilton (1856) and Professor Fraser (1856-60), himself becoming professor of logic and rhetoric at St. Andrews (1860) and at Glasgow (1864). His most notable works are *The History and Poetry of the Scottish Border* (1893) and *The Feeling for Nature in Scottish Poetry* (1887).

Veitch, WILLIAM (1794-1885), Scottish scholar, born at Spittal-on-Rule in Roxburghshire. He became a licentiate of the Church of Scotland, but ultimately devoted himself to study and tuition. He was a man of rare scholarship and a famous raconteur. He published Cicero's *De Natura Deorum*; *Greek Verbs, Irregular and Defective* (1848); assisted Liddell and Scott with the *Greek Lexicon*.

Vejle, tn., Denmark, Jutland, 30 m. S.W. of Aarhus; has breweries, distilleries, tanneries, and tobacco factories. Pop. (1901) 14,592.

Velasquez, DIEGO (?1465-1523), Spanish soldier of fortune, surnamed 'the Conquistador,' accompanied Columbus on his second voyage (1493), and was

employed by the king of Spain and by Columbus. In 1514 he brought Cuba under subjection. He then became governor of the new territory, and sent Cortes to conquer Mexico.

Velasquez, DIEGO RODRIGUEZ DE SILVA Y (1599-1660), the greatest of Spanish painters and one of the greatest of all painters, was the representative in art of the dignified, aristocratic national types, just as Murillo is less individual, more cosmopolitan by reason of his more democratic birth and associations. Born in Seville, Velasquez studied under Herrera, then under Pacheco, whose daughter he married, and at whose house he met Cervantes and other notabilities. In 1623 Olivares, the great minister, invited him to Madrid, and persuaded the king to sit for his portrait. Velasquez then became the favourite of Philip IV.; was elected court painter, and held various offices at court. His position there freed him from the supervision of the church and from warnings by the Inquisition. The immunity from the necessity of painting religious subjects is one of the several causes that led to his essentially modern development—a modernity fully appreciated and understood since the 19th century only. In his own country his influence was not wide; but he has become the dominating influence of schools of French, English, and American artists of to-day. In 1623 Charles I. of England, then Prince of Wales, sat to him. In 1630, by the advice of Rubens, he visited Italy, and in Venice he studied Tintoretto. In 1648 he again went to Italy, commissioned by Philip to buy pictures in order to form a Spanish academy. Whilst in Rome he painted the magnificent portrait of Innocent X. On his return he was made marshal of the court. It was in fulfilment of this office during the conference at Irun, on the 'Island of Pheasants,' that he caught his death-fever. A superb colourist, admirable draughtsman, intensely truthful in his statements, synthetic in the approach to and handling of his subject, he selected the salient characteristics of the person or scene, and eliminated all non-essentials; he had a keen sense of the unity of impression, emphasized by a carefully realized harmony of colour. His favourite scheme of cool grays doubtless grew out of familiarity with and appreciation of the large cool rooms, with their quiet shadows, of the palace where so much of his work was done. To know Velasquez properly he must be studied in Madrid; but fine examples are to be seen of him in Rome, the Louvre,

and the National Gallery, London. His *Venus with a Mirror*, formerly in the Rokeyby Collection, was acquired for the National Collection in 1906 for £45,000. See R. A. M. Stevenson's *Velasquez* (1899), Sir W. Stirling-Maxwell's *Velasquez and his Works* (1855), Charles B. Curtis's *Velasquez and Murillo* (1883), Bernete's *Velasquez* (1898), and Hinde's *Days with Velasquez* (1906).

Velde. See VAN DE VELDE. **Veldes**, summer resort, Carniola, Austria, 30 m. N.W. of Laibach; with mineral spring and sun baths. Pop. (1900) 1,646.

Velez, tn., prov. Santander, Colombia, 65 m. N.E. of Bogotá. Pop. 15,000.

Velez de Guevara. See GUEVARA.

Velez Malaga, city, prov. Malaga, Spain, 15 m. E.N.E. of Malaga. Produces raisins, olive oil, and sugar. Pop. (1900) 23,586.

Velez Rubio, tn., prov. Almeria, Spain, 54 m. N.N.E. of Almeria, in Sierra Maria Mts., on an eminence overlooking a lovely valley. Pop. (1900) 10,109.

Velia, in Greek HYELE or ELEA, a Phocæan colony on the W. coast of Italy, in ancient Lucania, founded c. 540 B.C. It became an ally of Rome in the 3rd century B.C. Under the empire it declined; about 800 A.D. the Saracens completed its ruin. It is famous for the Eleatic school of philosophy, founded by Xenophanes of Colophon, who settled there, and continued by Parmenides and Zeno, natives of Elea.

Velij, tn., Vitebsk gov., W. Russia, 49 m. N.E. of Vitebsk city, on W. Dwina (Düna); with a castle built by Ivan the Terrible in 1536. It is a river-port, and has various industries. Pop. (1897) 12,201.

Velleius, PATERCULUS. See PATERCULUS.

Velletri (anc. *Velitrae*), tn. and episc. see, prov. Rome, Latium, Italy, at S.E. foot of Monti Albani, 22 m. S.E. of Rome; produces wine. Here Garibaldi won a victory over the king of Naples, May 19, 1849. The cathedral of San Clemente dates from the 17th century. Pop. (1901) 18,734.

Vellore, munic. tn. and military station, N. Arcot dist., Madras Presidency, India, 80 m. S.W. of Madras. It was defended by the British against Haidar Ali in 1780-2. In 1806 the Sepoy soldiers at Vellore mutinied, and massacred the European officers and residents. Pop. (1901) 43,537.

Vellozia, a genus of tropical woody-stem plants belonging to the order Amaryllidaceæ. They are mostly natives of S. Africa and Brazil. The leaves grow in clusters at the tips of the branches, and the showy campanulate flowers are borne singly.

Vellum. See PARCHMENT.
Velocity is primarily the rate of change of position of a moving point, but it is also applied to the rate at which a state or con-

The speed or amount of velocity is measured by dividing the length passed over in a short time by the time taken. The shorter the time and the shorter the corresponding

mile per hour. The relative velocities to which we are accustomed at the earth's surface are comparatively small, rarely exceeding half a mile a second. The earth's equatorial regions rotate about the axis with a speed of fully a thousand miles an hour—not quite a quarter of a mile a second. The earth's own speed in its orbit is about 18 m. a second. But outside the earth we have in the motions of other cosmical bodies examples of much greater velocities, such as 50 or 100 m. a second. As regards the velocity of states, we have the various speeds of propagation of water waves, the velocity of sound waves through air (1,000 ft. per second), and of earthquake vibrations through the earth (7 or 8 m. per second). Finally, the motion which constitutes light is propagated through space with a speed of 180,000 m. a second.

Velvet, a textile stuff, usually of silk, smooth on one side, but sometimes double-faced, with on the other a close, erect nap or pile, formed by the interweaving on brass wires of a second warp, the loops of which, cut or uncut, form the velvet. When made of cotton and silk, it is termed velveteen; other materials are also used. Appearing later than silk, satin, damask, cloth of gold, it marks the end of the Gothic and the advent of renaissance art. Though assigned by some to India, whence it was imported into Italy (Venice, Genoa), Fischbach (*Ornamente der Gewebe*, 1874-8) considers 'it owes its existence to no Oriental source,' while W. Morris (*Textile Fabrics*, 1884), believes it was suggested by pile carpets, invented at Paris in the 14th century. He is supported by Aymer Vallance (*Art Journal*, 1891), who points out that in velvet patterns animal or Eastern symbolism is replaced by foliage. Thus the pine-needle symbolizes the West Indies (1492), and the pomegranate Spanish influence (Catherine and Arthur, 1501). Matthew Paris (d. 1259), however, refers to 'napped cloth called by the Gauls *villuse*.' Again (the German *sammlet* points to an identification with *samite*; and *musterdevelers* (15th century) may be *moitié de velours*. Fustian was probably a coarse imitation. Velvet was used for priestly robes (1363), and for black and red altar cloths, besides supplying 'bonnets' to Saint Louis, Louis XII., Charles XIII., and Francis I. The magnificent cope made for Henry VII., preserved at Stonyhurst College, woven at Florence, of gold tissue with crimson outstanding design in silk, is probably the finest specimen of the stuff in England; and the art of manufacture reached its climax



A Portrait by Velasquez—Admiral Pulido-Pareja. In the National Gallery, London.

(Photo by Hanfstaengl.)

figuration passes along among particles. It is a vector quantity, and is completely specified when the direction of motion is given as well as the speed or rate at which space is being described.

length passed over, the more accurate will be the estimate of the speed. The unit of velocity is that velocity with which a point will pass over unit length in unit time—e.g. a foot per second, a

between the 14th and 16th centuries. In the middle ages Genoa, Venice, Florence, Milan, and Lucca were famous seats of velvet manufacture. In 1536 velvet-making was introduced from Geneva to Lyons, now superior even to Genoa in silk-velvet making. After 1685 refugees from France spread a knowledge of the art in England (Spitalfields and Derby) and Holland (Haarlem). Switzerland, Crefeld, and Bradford are now important manufacturing centres; and Manchester and Amiens are rivals in the output of velveteen. Other varieties are Utrecht velvet, of mohair, stamped for furnishing purposes; plush, of waste or spun silk; tapestry; broché; ribbed; seal, from tussur silk; Genoese, with uncut loop, called 'terry' in England and *frisé* in France.

Velveteen. See VELVET.



Vendace.

Vendace (*Coregonus vendaceus*), a fresh-water member of the salmon family, which is nearly related to the pollan, but is confined to Lochmaben in Scotland. It is, however, nearly allied to, if not identical with, a form occurring in the lakes and rivers of Sweden. The vendace is from six to eight inches long, brownish in colour, with a re' heart-shaped mark between the eyes, and has the lower jaw slightly protruding.

Vendée, LA, dep. of W. France, between Bay of Biscay on W. and dep. Deux-Sèvres on E., covering an area of 2,690 sq. m. It is fertile in the s., wooded in the N., and marshy towards the coast. Wheat and wine are produced. The capital is La Roche-sur-Yon. La Vendée was famous for the stubborn resistance of its people to the revolution (1793-4). Pop. (1901) 441,311.

Vendémiaire, the name given by the French republic to the opening months of the calendar. It commenced on September 22nd or 23rd, and closed October 21st or 22nd.

Vendetta, a hereditary blood-feud between families or tribes. The custom is not confined to Italy, or to Europe, or to any special period of the world's history. The general form which this 'law of retaliation' assumes is that, when one member of a *gens* has suffered serious injury, or has been put to death, by one or more members of another *gens*, the kinsmen of the victim are bound to inflict a similar injury upon the offenders.

The practice still survives among the Corsicans and Sardinians, the Mainotes of Greece, the Tibbus of the Eastern Sahara, and in parts of the United States. In Mark Twain's *Huckleberry Finn* there is a powerful description of the working of this bloody law in the Mississippi region about the year 1850.

Vendôme (Lat. *Vindocinum*), tn., dep. Loir-et-Cher, France, on Loir, 19 m. N.N.W. of Blois; has manufacture of gloves, leather goods, cotton goods, and cheeses. It has the ruins of a Renaissance abbey, the 12th to 15th century church of the Trinity, and the remains of the 11th-century castle of the dukes of Vendôme. Pop. (1901) 8,449.

Vendôme, a former French county and duchy. The countyship was created (1515) a duchy by Francis I. for Charles of Bourbon. Through him it was inherited by Henry IV., and was by him bequeathed (1595) to his eldest son César. Louis, Duc de Vendôme, the eldest son of César, was father of the noted general Louis Joseph.

Vendôme, LOUIS JOSEPH (1654-1712), French general, born at Paris, the eldest son of César, Duc de Vendôme, by Laura Mancini, niece of Cardinal Mazarin. He distinguished himself against the Dutch in 1672, and served under Turenne in Germany, and under Luxembourg in the Netherlands, also (1693) under Catinat in Italy. In 1695 he was in command in Catalonia, and took Barcelona in 1697. Five years later he commanded in Italy, and twice fought indecisive battles against Prince Eugene. He overthrew the Austrians at Calcinato in 1706. The same year he superseded Villeroi in the Low Countries, but the disaster at Oudenarde (1708) lost him his credit and command. In 1710 he was again in Spain to support Philip. The Spanish campaign restored his military reputation.

Vendor and Purchaser. The law with regard to the sale of land in England is usually treated under the title of vendor and purchaser. It is provided by sec. 4. of the Statute of Frauds, that no contract for the sale of land can be enforced unless it is evidenced by a memorandum in writing, signed by the party to be charged, or his lawfully authorized agent. The contract does not require to be expressed in one document, but may be contained in a number of documents, such as a series of letters. But the writing must evidence a completed contract, an offer unconditionally accepted without variation. The parties and the property must be described so that there is no real doubt as to their

identity, and the consideration must be stated either as a named price, or a price to be arrived at in a specified manner. In contracts of this kind, there is a special obligation to show good faith, and the vendor must not conceal material latent defects, or the purchaser may be held entitled to avoid the contract. After the contract is made, there remains a good deal to do before the transaction is fully carried out. The title to the property must be shown, and verified, and accepted; a proper deed of conveyance must be prepared and executed; possession must be given to the purchaser, and the purchase money must be paid.

In the case of sales by auction there are usually printed particulars and conditions of sale, which describe the property and set forth the terms on which it is to be sold; and in the case of sales by private bargain, there is usually a formal agreement containing special conditions, which of course regulate the rights of the vendor and the purchaser. But when there are no special conditions, but what is called an open contract, or a simple agreement by the vendor to sell and the purchaser to buy the property described at the price stated, then the law implies certain conditions which regulate the rights and determine the duties of the parties under the contract. As soon as a valid contract is completed, the vendor becomes in equity a trustee of the property for the purchaser, and, as between the parties at any rate, the beneficial ownership passes to the purchaser. The purchaser, on the other hand, becomes a trustee of the purchase money for the vendor. The vendor must take reasonable care of the property, and must pay the outgoings as he receives the rents and profits; but the property is at the risk of the purchaser, and he must bear all accidental losses, and is entitled to all accidental gains. As from the date fixed for completion, or, if there is no date fixed, then from the time at which a good title is shown, the purchaser is entitled to possession or to the rents and profits, and the vendor is entitled to interest on the purchase money, and has a lien for the unpaid purchase money. The purchaser also has a lien for any deposit paid by him from the date of payment. The rights of the vendor and purchaser as between themselves are not affected by the death, bankruptcy, or lunacy of either party. See *Dart's Vendors and Purchasers of Real Estate* (ed. 1905).

Venediger, GROSS, a snowy summit (12,008 ft.), the second highest of the Hohe Tauern range

in the Central Tyrolean Alps. It was first climbed in 1841 by a party of twenty-six men.

Veneer, a very thin sheet of ornamental wood glued over common wood. See WOODWORK and INLAYING.

Vener, or **WENER**, the largest of the Swedish lakes, in the S.W. of the country, is 290 ft. deep, and 2,150 sq. m. in extent. Towards the south the lake discharges through the Göta.

Venerable, a British first-class battleship (15,000 tons), launched 1899. A ship of this name took part in the battle of Camperdown (1797).

Veneral diseases embrace three distinct contagious disorders, which are usually contracted and transmitted by impure sexual intercourse: (1) simple or soft chancre, sometimes called local venerical sore, (2) syphilis, and (3) gonorrhœa. The soft sore begins within a few hours after contagion as a pustule, which bursts and leaves an excavated ulcer with abundant purulent discharge. It is usually multiple, and is seldom situated far from the genital organs. Repeated attacks are common, but soft chancres never cause general infection of the system. Syphilis and gonorrhœa are treated in separate articles.

Venesection, or **PHLEBOTOMY**, an operation for the abstraction of blood from an incised vein. The arm is bound above the elbow with a broad bandage. The vein is then opened by an oblique slit. Slight pressure over the wound is sufficient to arrest the hemorrhage, and an antiseptic dressing should be applied, and kept in position by collodion or by a figure of eight bandage round the forearm. The operation is now seldom performed, although in the early part of the 19th century healthy men, women, and children were bled as a matter of course, three or four times yearly, while in disease its application was almost universal. In many morbid conditions venesection is undoubtedly of value as a remedial measure.

Veneti, an ancient tribe of N. Italy. Homer mentions a tribe called Heneti in Paphlagonia, whom the ancients believed to have settled in N. Italy, led by the Trojan prince Antenor; but this is at least doubtful. Tacitus mentions a tribe living on the S. shore of the Baltic as Venedi or Veneti, who are identical with the modern Wends; it is on the whole most likely that the Italian Veneti were an offshoot from them. Mommsen, however, classes the Veneti as Illyrians, or perhaps Albanians. Gradually the Veneti came under Roman rule, by way of alliance, not of conquest, prob-

ably during the 2nd century B.C. Attila in 452 A.D. destroyed Aquileia, Concordia, Altinum, Patavium (Padua), Verona, and other cities belonging to them. Their fugitive inhabitants took refuge in the small islands among the lagoons which border the coast; and out of these settlements grew Venice. See VENICE.

Venetian Red, a pigment composed of ferric oxide, Fe_2O_3 , and obtained by igniting ferrous sulphate. It is of fine rich colour, and is permanent and harmless.

Venetian Style. In the 13th century, when the cathedrals of Amiens, Salisbury, and Toledo were built, Italy attempted to imitate them, and many of the buildings erected in Venice in the 14th century exhibit this foreign influence, and are said to be in the Venetian or Venetian Gothic style. The palace of Ca d'Oro is a good example.

Venezianov, ALEXANDER (1779-1845), called the Father of Russian painting. When genre was considered the lowest grade of art, at a time when the Russian peasant was bought and sold like an animal, Venezianov turned to the depiction of peasant life. His method of work was inspired by a study of English copperplate engravings. His work is heavy, earnest, observant, and truthful.

Venezuela, a S. American republic, extending along the N. coast from British Guiana to the Gulf of Venezuela, and bordering on Colombia and Brazil in the W. and S. Geographically it falls into three divisions: a mountain land along the northern coast, the plains of the Orinoco, and a region of older degraded elevations S. of the river—Venezuelan Guiana. In the N.W. the cordillera of Merida runs north-eastwards to Barquisimeto, while another branch, the cordillera of Perija, forms the boundary of the republic W. of Lake Maracaibo. These ranges are distinct from the Andes proper. Their maximum height is about 15,400 ft., and many of the summits are capped with snow, the snow-line lying at about 13,000 ft. above sea-level. The Caribbean Mts., which reach up to 9,125 ft. in Naiguata, extend to Trinidad with two breaks—the one at Barcelona, the other at the Gulf of Paria. The islands Tortuga, Margarita, and perhaps Tobago, are probably the summits of a submerged range. The llanos were formed by Quaternary deposits laid down on Tertiary formations by a sea which rose to a height of from 700 to 1,000 ft. up the slopes of the mountains. In the W. they are well watered, but between the Rio Chico and Soledad lies a sandy desert. Venezuelan Guiana is supposed to consist of crystalline rocks overlaid in the

E. by enormous masses of Cretaceous sandstone, which rise to the highest summits, such as Roraima (8,530 ft.). The inner recesses of the western part have seldom been visited by travellers, the dense woods and exceedingly moist atmosphere rendering progress difficult except along the larger streams. Near the Orinoco and its chief tributaries savannas suitable for grazing lie among the hills.

With respect to temperature, three zones are recognized in Venezuela—the *tierra caliente*, extending from sea-level up to about 1,800 ft.; the *tierra templada*, up to 7,200 ft.; and the *tierra fria*. These have mean temperatures of 86° to 77° F., 77° to 60° , and below 60° respectively. The coast is particularly hot, La Guaira having an annual mean of $83\frac{1}{2}^\circ$, and in the llanos the heat is said to be still more oppressive. The rainfall is 70 in. a year at Maracaibo, 65 in. on the Caribbean coast, 63 in. at the Gulf of Paria, 60 in. along the Orinoco, and $31\frac{1}{2}$ in. at Caracas. Cocoa palms and cocoa are confined to the *tierra caliente*; cactuses, mimosa, and agaves grow where there is a lack of moisture. Agriculture is the principal occupation of N. Venezuela. The most important crops are coffee, cocoa, sugarcane, maize, and bananas; while tobacco, cotton, copra, and potatoes are of minor importance. The forests yield timber, copaiba balsam, vanilla, cinchona bark, dye-stuffs, and rubber, as well as skins of wild animals. Gold occurs abundantly in the Yuruari basin, the richest mine being El Callao. Copper is worked at Aroa, N. of Barquisimeto, and iron occurs near Trujillo. The coal mines of Nariacal (Barcelona) promise to be very valuable, and seams also occur between Caracas and Valencia. Asphalt is found at the Gulf of Paria and Lake Maracaibo. The chief ports are La Guaira, Puerto Cabello, Maracaibo, and Ciudad Bolivar on the Orinoco. La Guaira is connected by rail with Caracas, the capital.

The coast of Venezuela was seen by Columbus on his third voyage to America in 1498, and the Spaniards gradually subdued the country, Coro being their headquarters. In 1749 the colonists rose in revolt. On this occasion the insurrection was suppressed, but new disturbances broke out in 1797, resulting in 1819 in the formation of the republic of Colombia, in which the present Colombia and Ecuador were included. On the death of Bolivar in 1830 the federation was dissolved, and the present republic of Venezuela was formed. Civil dissensions have seriously retarded the progress of the country, except during the

presidency of Guzman Blanco 1870-89. In 1895-6 the dispute between Venezuela and Britain as to the boundary between the former country and British Guiana became dangerous, in consequence of the intervention of President Cleveland, as the defender of the Monroe doctrine, on behalf of Venezuela. The difference was, however, referred to the arbitration of an Anglo-American commission, which sat at Paris in 1899. In 1902 Germany and Britain instituted a blockade of the Venezuelan ports in default of

by a president, elected for six years, and a federal council of nineteen members. The legislative power is exercised by a Senate and House of Representatives. There are five bishops—of Merida, Barquisimeto, Calabozo, Zulia, and Guaiana—subordinate to the archbishop of Caracas. There is a standing army of about 8,000 men, besides a militia of over 60,000. The population is chiefly of Indian blood, mixed with white and negro. Area about 364,000 sq. m. Pop. 2,500,000. Capital, Caracas. See W. L. Scruggs's

offences that separate the soul from God. Venial sins, which are rather faults than offences, may or may not be disclosed in auricular confession.

Venice, fort. scapt. and cap. of prov. of Venice, N.E. Italy, in the lagoons of the Adriatic, between the Piave and the Po, 164 m. by rail E. of Milan. The foundations of the city rest on piles driven into the mud. Glass is one of its most famous manufactures, beads, all sorts of Venetian ware, mirrors, mosaics, electric lamps, candelabra, etc., being



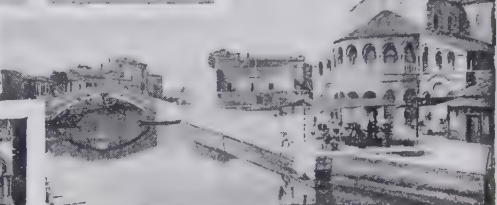
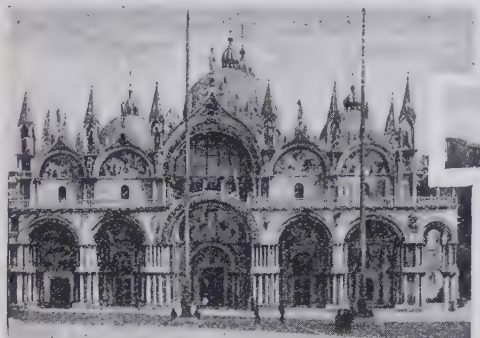
satisfaction for injuries done to their subjects. The matter was (in part) referred to the Hague tribunal, and 30 per cent. of the customs dues levied at La Guaira and Porto Cabello were set aside in fulfilment of the Anglo-German claims. The latest reliable figures show that the exports, consisting chiefly of coffee, cocoa, hides, cattle, copibaia, fustic, and dividi, amounted to £1,586,000 in 1905, in 1904 Venezuela imported from Britain goods to the value of £721,754, and from the United States to the value of £633,093. Venezuela is governed

The Colombian and Venezuelan Republics (1900); Spence's *The Land of Bolívar* (1878); Villavicencio's *La Republica de Venezuela* (1899); Sachs's *Aus den Llanos* (1899); Sievers's *Venezuela* (1888); Mombello's *Venezuela y sus Riquezas* (1890).

Vengurla, seapt. tn. and municipality, Ratnagiri dist., Bombay Presidency, India, 33 m. N.W. of Goa. In 1812 it was ceded to the British. Pop. (1901) 19,018.

Venial Sins are differentiated from 'mortal' sins, which the Council of Trent defined as

manufactured chiefly on the isl. of Murano; also tapestry, brocades, lace (on the isl. of Burano velvets, silks, machinery, and chemicals. Shipbuilding and the making of torpedoes are carried on. Here is a maritime station. The seaport is now the second in Italy, ranking after Genoa. Among the many fine churches, the basilica of St. Mark is marked out as one of the three finest in Italy; others are the churches of SS. Giovanni e Paolo (the burial-place of the doges), Santa Maria dei Frari, Santa Maria della Salute, San Giorgio degli Schia-



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Views in Venice.

1. Piazzetta di S. Marco and Church of Sta. Maria della Salute. 2. Ducal Palace and Piazzetta di S. Marco, with the Campanile as now-being rebuilt. 3. Grand Canal, from the Ponte dell' Accademia. 4. Bridge of the Rialto. 5. Basilica of St. Mark. 6. Island of Murano and Grand Canal. 7. Palazzo Ducale. 8. Arsenal Gates. 9. The Bridge of Sighs.

voni, San Salvatore, and San Pietro di Castello. On the N. side of the Piazza of St. Mark stands the Procuratie Vecchie, and on the S. side the Procuratie Nuove (now part of the Palazzo Reale, and the doge's palace on the E.). Other palaces are the Contarini on the Grand Canal, Foscari, and Vendramin-Calergi. There are many fine tombs, including those of Pietro Mocenigo, Andrea Vendramin, and Michele Morosini. Other places and objects of great interest are the Academy of Fine Arts (containing Venetian canvases from the earliest times), the municipal museum, the quay Riva degli Schiavoni, the Rialto, the Bridge of Sighs, and the granite column, surmounted by the Winged Lion of St. Mark, on

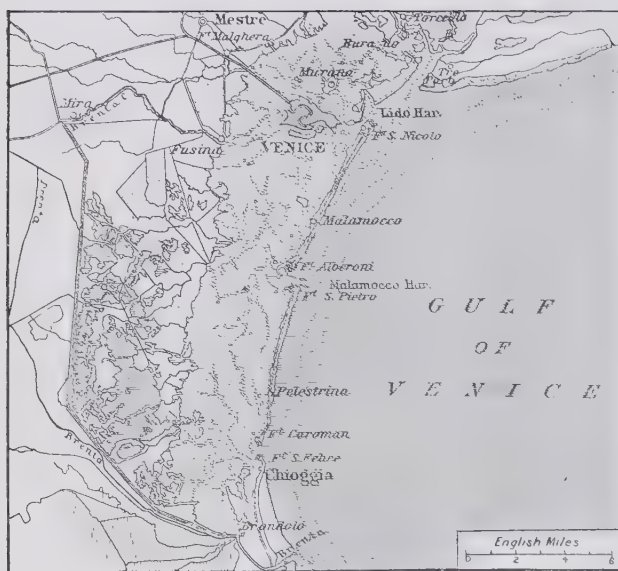
ing her ships as far as England for wool and to the Black Sea for furs, while her merchants penetrated to India and China. By taking part in the crusades she obtained trading stations in the Holy Land, and as the Eastern empire fell into decrepitude acquired many of its possessions, establishing colonies in Crete, Cyprus, the Morea, and the Aegean Islands. But she soon came into conflict with Genoa, with whom she struggled for the monopoly of Eastern trade. The favour shown to Genoa by the Greek emperors led Venice to assist in establishing the Latin empire of Constantinople (1204-61), which was practically under her direction. After three ruinous but indecisive wars, the final

her enemies soon quarrelled amongst themselves, and she was able to regain a great part. Her resources were exhausted by these wars, and her commercial supremacy began to decline after the discovery of the Cape of Good Hope (1486).

Meanwhile she had been, since the fall of Constantinople (1453), involved in a terrible struggle with the Turks. The Venetians defended their eastern colonies with great gallantry, and it was to them that the victory of Lepanto (1571) was mainly due. The struggle lasted until 1718, when the Morea, the last of their eastern possessions, was lost. Venice had meanwhile sunk into political insignificance, though she maintained her independence until she had to submit to Napoleon (1797). Her government was monopolized by a strong oligarchy, which, by the 'closing of the Grand Council' (1797), finally excluded all but members of aristocratic families from political power. At the same time, the council stopped any danger of the establishment of a tyranny, as in other Italian states, by preventing the doge from making his office hereditary, and gradually depriving him of all substantial power, until he became a mere figure-head. The chief place in the government was from the 14th century taken by the Council of Ten, which proved a most effective, secret, and powerful executive.

After the fall of Napoleon, Venice fell to Austria; but the government was so oppressive that she revolted, and under the leadership (1848-9) of Daniele Manin she drove out the Austrians, and joined in the struggle for Italian independence. Even after the failure of Charles Albert's expeditions into Lombardy, she refused to yield, and was only reduced, after a year's siege, by famine and cholera. When Lombardy was freed in 1859, Venice remained under the Austrian yoke, and it was not until 1866 that she was united to the Italian kingdom. See Romanini's *Storia Documentata di Venezia* (1853-61), Heyd's *Le Colonie Commerciali degli Italiani in Oriente* (1865), Brown's *In and around Venice* (1905), Hodgson's *Venice* (1905), Marion Crawford's *Gleanings from Venetian History* (1905), and Molmenti's *History of Venice* (Eng. trans. 1906).

Veni, Creator Spiritus, an invocation to the Holy Ghost, found in the collection of ancient hymns by Thomasius, and in the pontifical of Soissons (11th century). The first version in the English Book of Common Prayer was introduced in 1661. The *Veni Creator* is used in the Eng-



Venice and its Surroundings.

the Piazzetta. The famous Campanile collapsed on July 14, 1902; it is now in process of reconstruction (1906). The Lido and the Littorale di Malamocco are favourite resorts. Pop. (1901) 151,840. The marshes and islands of the lagoons at the N.W. end of the Adriatic were first inhabited by refugees from the barbarian invaders of Italy. In the 7th century the twelve 'townships' agreed to elect one supreme magistrate, the 'doge.' Venice maintained her independence of the mainland states, while the skill of her citizens as sailors enabled her to develop a powerful fleet, and to become a great commercial state. She dominated the Adriatic, and gradually absorbed most of the carrying trade of the world, send-

ing her ships as far as England for wool and to the Black Sea for furs, while her merchants penetrated to India and China. By taking part in the crusades she obtained trading stations in the Holy Land, and as the Eastern empire fell into decrepitude acquired many of its possessions, establishing colonies in Crete, Cyprus, the Morea, and the Aegean Islands. But she soon came into conflict with Genoa, with whom she struggled for the monopoly of Eastern trade. The favour shown to Genoa by the Greek emperors led Venice to assist in establishing the Latin empire of Constantinople (1204-61), which was practically under her direction. After three ruinous but indecisive wars, the final

contest was fought out in 1379. The Genoese penetrated into the lagoons, and blockaded Venice itself; but her people in turn blockaded the Genoese fleet, and forced it to surrender. By ruining the houses of Scala and Carrara, Venice acquired Treviso, Verona, Padua, and other towns on the mainland of Italy, and at the expense of the dukes of Milan she obtained Brescia, Bergamo, and Cremona. This involved her in a great expenditure on mercenary armies. The other states became very jealous of her; and she was attacked by a European alliance, the League of Cambray (1509), including the emperor and the kings of France and Spain. Venice lost nearly all her mainland territory; but

lish Ordinal before the laying on of hands at ordination of priests and at consecration of bishops.

Venlo, tn, and railway junction of the Netherlands, prov. Limburg, 43 m. by rail N. by E. of Maastricht, on r. bk. of the Maas. Pop. (1900) 14,399.

Venosa, tn., Potenza prov., Basilicata, S. Italy, 23 m. N. of Potenza; was the birthplace of Horace. It has a cathedral, an 11th-century abbey, and a 15th-century castle. Pop. (1901) 8,503.

Venta, the ancient name of three towns in Britain. (1.) Venta Belgarum, now Winchester, where Roman remains have been found. (2.) Venta Silurum, on the w. coast of the estuary of the Severn, in Monmouthshire, now known as Caerwent. (3.) Venta Icenorum, on the E. coast of England, probably Caistor on the Wensum, s. of Norwich.

Antony; was made consul; continued to support Antony when at variance with Octavian; and in 39 was sent as his deputy into Asia against Labienus. There he defeated the Parthians, secured the army of Labienus, and defeated the Parthians a second time in Cilicia. He then occupied Syria and Palestine, and a third time defeated the Parthians under Pacorus. Antony then arrived, and in jealousy dismissed Ventidius; but the senate voted him a triumph in November 38 B.C.

Ventilation. A human being expires from '6 to '8 cub. ft. of carbon dioxide (CO₂) per hour, besides polluting the atmosphere with various organic impurities. Since these latter increase proportionally as the carbon dioxide increases, the quantity of CO₂ in a sample of air is usually taken to represent its quality. Pure

cub. ft. of CO₂ for each 2 cub. ft. of gas properly burned. An ordinary three-light gasalier burns 12 cub. ft. of gas per hour.

Overcrowding.—In 1863, Glasgow obtained parliamentary powers to deal with overcrowding. This act was amended in 1890, when the standard of cubic space was raised from 300 to 400 cub. ft. for an adult, and 200 cub. ft. for a child below ten years of age. Prisons have from 750 to 800 cub. ft. of space per individual; seamen's cabins and canal boats, 180 for the aft cabin and 80 for the fore cabin; schools, from 100 to 240; and hospitals, from 800 to 4,000 cub. ft. per individual.

Inlets.—Air at 50° or 60° F. may come into a room at the rate of about 2 ft. per second. The outside of an inlet shaft should be guarded by a baffle plate, grating, or wire gauze. The area of the inlet must be increased from 25 per cent. to 50 per cent. at a grating or gauze screen, to compensate for friction. A common form of inlet is Tobin's tube. It consists of a square box or tube fastened to the wall of a room. The lower end communicates with the outer air, while the upper end opens into the room. The area of the opening may be regulated by a valve, and a muslin filter may be inserted to keep particles of dust out of the room. A coil of hot pipes in the tube may heat up the incoming air, or the air may be passed through a radiator before entering the apartment. An ingenious arrangement was invented by the medical officer for Leeds. In an enlarged Tobin's tube coils of hot-water pipes are placed on one side of a central diaphragm. A valve at the top of this diaphragm may shut down either on the top of the pipes, or on the top of the vacant space.

In the first case the air is not warmed, but simply passes through the vacant half of the Tobin's tube, while in the second case the air is constrained to pass between the pipes and is heated. Stevens's ventilator is like a drawer without a back set in a wall. The Sheringham valve is simply a flap in the wall, and has sides to it. It may be opened to any desired extent, and throws the supply of fresh air upwards, preventing cold draughts on the head. Fresh air should be admitted into a room about six feet above the floor. Dr. Bird's method of window ventilation achieves this. A board is put below the lower sash of an ordinary window, and air comes in at the opening so made in the middle of the window. Arrangements of concentric tubes



Venti, the Latin for 'the winds.' Homer mentions Boreas (N. wind), Eurus (E.), Notus (S.), and Zephyrus (W.), with their master Æolus, who dwelt in the island Æolia. According to Hesiod, the beneficial winds were Boreas, Notus, and Zephyrus; and the destructive ones, such as Eurus, and especially Typhon, were the offspring of Typhoeus. In art the winds are usually represented (especially on the Tower of the Winds at Athens) with human bodies, winged shoulders, and various attributes.

Ventidius, or in full, PUBLIUS VENTIDIUS BASSUS, Roman general, was a native of Picenum. In the Gallic campaigns and in the civil war he served Cæsar well, and became tribune, senator, and after Cæsar's death prætor, in 43 B.C. He then aided

fresh air has from 2 to 5 parts of CO₂ per 10,000, and in no case should the proportion rise above 10 parts per 10,000. For living apartments 6 to 8 parts is the maximum allowable in good ventilating practice. In Britain, if the air is warm, a room may be emptied and filled with pure air four or five times per hour, while with cold air three times is the maximum without causing draughts. It may be calculated that a man requires about 3,000 cub. ft. of air per hour. A woman takes 2,500, and a child 1,600. A horse or a cow requires about 8,000 cub. ft. of air per hour, or, assuming that its supply of air is changed five times per hour, it should have 1,600 cub. ft. of space. Gaslights in a room pollute the air to the extent of 1

to act as inlets and outlets combined are not satisfactory, as an open window or even a fire in the room may turn both tubes into either outlets or inlets.

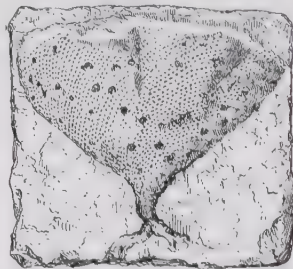
Outlets.—As an outlet an opening may be made near the ceiling of a room into the chimney. This opening would be guarded by a flap valve of metal, mica, or silk, which allows air to pass from the room into the chimney, but instantly shuts when air tries to pass from the chimney into the room. In Dr. Chowne's inverted siphon system the foul air is led to the back of the fireplace about nine inches from the floor, and thence away by the chimney. A shaft may be led from the outlet up to the mason-work of the chimney, and a louvre fitted there. A very satisfactory outlet is either the Boyle or Buchan air-pump extractor. The wind or motion of the atmosphere, acting on the thin metal plates of which these extractors are made, is diverted through them in such a way as to draw air from the shaft. The Emerson cowl is a cone of sheet metal fixed on the top of a pipe. The cone should have a base of the same material, to prevent currents of air impinging on the inner surface of the cone and being directed down the pipe. Sugg's ventilator is similar, but has a mica flap to prevent down-draughts. The draughts induced by gaslights and fires may be utilized. In the House of Commons the incoming air is washed, cooled by ice trays or heated by hot pipes, and may be filtered through cotton wool to exclude fog. It is supplied to the house through cocoanut mats on the floor, and rises upwards through the glass roof owing to the influence of the gases burning there, and also of the furnace which burns constantly in St. Stephen's tower at Westminster.

The Use of Fans.—Fans may be used either to draw the air out of a series of rooms or to force the air in. The Blackman fan is a good exhausting fan, and the Sturtevant a good forcing fan. It is argued by those who believe in forcing fresh air into a room (this is called the 'plenum' system) that the amount of air can be exactly regulated as regards quantity, temperature, and humidity. Fans are used extensively for removing dust and refuse from grinding-shops, carpet-beaters, sawmills, and such places, and for forcing warmed and moistened air into textile and other workshops. A fan four feet in diameter will pass about 20,000 cub. ft. of air through it per minute, running at the rate of 500 revolutions per minute, and consuming $1\frac{1}{2}$ horse power.

See Thomas's *Ventilation, Heating, and Lighting of Dwellings* (1905); Kittredge's *Warming and Ventilating*; Billing's *Ventilation* (1893); Buchan's *Ventilation* (1891); and Parkes's *Hygiene* (1891); also article on **HEATING**.

Tunnels.—The ventilation of tunnels is usually effected by the extraction of the vitiated air at, if possible, some point midway between the ends, up a shaft, in which is fixed a large fan. In the Mersey tunnel a ventilating heading was driven from each shore to the centre (and lowest part) of the tunnel, from which the air is extracted and drawn away by fans 40 ft. in diameter. For the Pracchia tunnel (between Florence and Bologna), in the St. Gothard tunnel, and in others, the Saccardo scheme of ventilation has been applied. By this system a large volume of air is blown into the mouth of the tunnel, in the annular space between the interior surface of the tunnel and that imaginary line inside which a train could just pass. This is effected by extending the tunnel for 15 or 20 ft. by a structure of timber or brickwork, the inside surface of which follows this imaginary line (the 'gauge of maximum construction'), and projects a few feet inside the tunnel. Into the chamber thus formed air is blown by a fan, and forms a strong current through the tunnel—independent itself of any passing train, and inducing, when no train is going through, an additional current through the interior space, after the manner of an injector.

For ventilation of mines, see **COAL-MINING**.



Ventriculites (V. impressus).

Ventimiglia, fort. seapt., Porto-Maurizio prov., Liguria, N. Italy, on Mediterranean, 9 m. w.s.w. of San Remo; has a museum of Roman antiquities, and a Gothic cathedral, which occupies the site of a temple of Juno. Pop. (1901) 11,468.

Ventnor, wat.-pl., Isle of Wight, England, 10 m. s.e. of Newport, situated on the Undercliff, and sheltered by St. Boni-

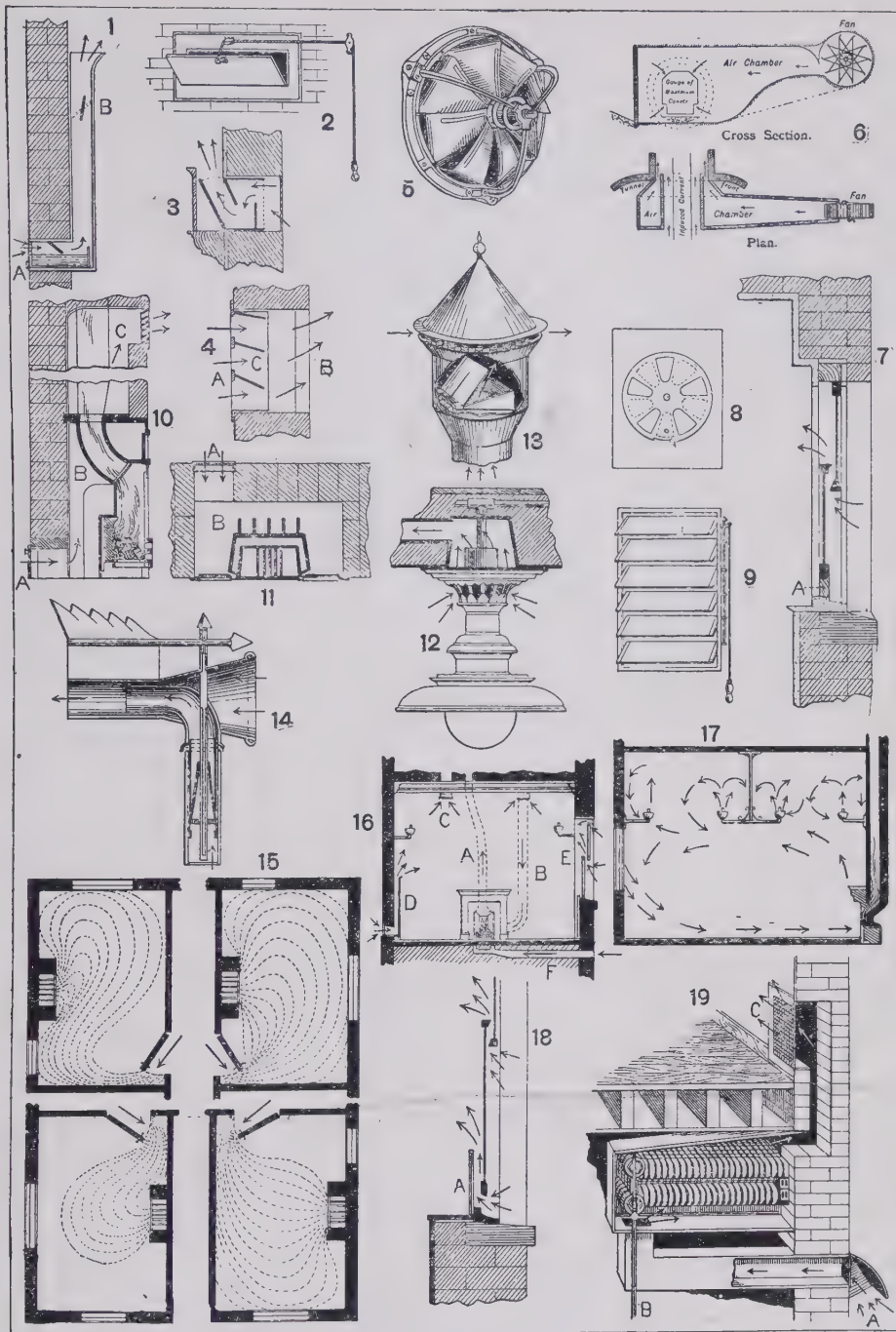
face Down (787 ft.). It enjoys a mild climate, beneficial in pulmonary affections; has a Royal National Hospital for Consumption, and other sanatoria. Bonchurch is a suburb. Pop. (1901) 5,866.

Ventriculites, a genus of fossil hexactinellid (six-rayed) sponges, very characteristic of the Upper White Chalk. They are cup or funnel shaped, with a series of root-processes at their base, and a large central cavity.

Ventriloquism is the art of producing the voice in such fashion that the sound appears to proceed from a source other than the speaker's mouth. The illusion is heightened by immobility of the visible muscles concerned in speech, as well as by gestures and glances which suggest to the onlooker a false source of the sound. Few ventriloquists can deceive in the dark; and most depend upon marionettes with movable lips, to the movements of which the attention of the audience is directed. The art owes its name to the erroneous idea of the Romans that the performer produced the voice in the stomach or abdomen.

Venue, the place from which a jury is to be summoned for the trial of an action or of an offence. The rules of the Supreme Court direct that 'there shall be no local venue for the trial of any action, except where otherwise provided by statute; but in every action in every division the place of trial shall be fixed by the court or a judge.' In criminal cases the venue is co-extensive with the jurisdiction of the court.

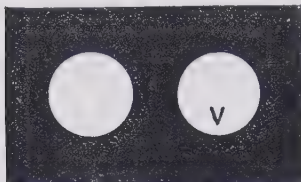
Venus, the second planet from the sun, known to the ancients, under its two aspects of morning and evening star, as Phosphorus and Hesperus. The knowledge of their identity was imported probably by Pythagoras from the East. Venus is the brightest of the planets. When the planet has an eastern elongation of approximately $39\frac{1}{2}^\circ$, its distance from ourselves is about 40,000,000 m. (Whitnell). Its light is then so brilliant as to attract the eye in full daylight, and to cast distinct shadows after dark. Venus describes round the sun, with an average velocity of 22 m. a second, in a period of 224.7 days, a slightly eccentric orbit, inclined $3^\circ 23'$ to the ecliptic. At its mean distance of 67,200,000 m., the solar radiation has twice its terrestrial intensity. The diameter of the planet is about 7,600 m., and there is no perceptible polar compression. Its mass is 0.82 and its density 0.94 those of the earth. Schiaparelli's conclusion of an axial movement performed in 225 days synchron-



Apparatus for Ventilation.

1. Tobin's tube: A, baffle plate for deflecting air on to movable tray of water or disinfectant; B, valve for regulating air current. 2. Sheringham air-valve. 3. Sheringham valve in form of cornice. 4. Chimney breast valve: A, outlet; B, chimney; C, noiseless silk valves. 5. Ventilating fan. 6. Plan and section of Saccardo system of tunnel ventilation. 7. Window ventilation: A, wood block under sash. 8. Cooper's revolving glass ventilator. 9. Glass louvre ventilator. 10. Section of Sir Douglas Galton's room grate: A, fresh air inlet; B, warm air chamber; C, warm air flue. 11. Plan of same: A, inlet; B, warm air chamber, with flanges to increase heating effect. 12. Wenham ventilating lamp. 13. Sugg's extract cowl. 14. Banner's cowl. 15. Diagram showing air currents between door and fireplace (Satchell). 16. Buchanan's aerial siphonic ventilation: A, vent; B, pipe in wall leading to back of grate; C, special outlet ventilating shaft; D, Tobin's tube; E, window, upper sash dropped; F, fresh air inlet. 17. Diagram showing different zones of air in room with gas burning and without proper ventilation. 18. Simple window ventilation (Buchan): A, plate of glass or wood. 19. Steam radiator, admitting warmed air to room: A, inlet for fresh cold air; B, steam pipe to radiator; C, warm air inlet.

ously with the orbital circulation has the weight of evidence in its favour. The spectrum of Venus is that of reflected sunlight, scarcely, if at all, modified by native absorption. Venus has no satellite.



Earth and Venus (v) compared.

Transits of Venus across the sun are observed when inferior conjunction occurs near one of the nodes of her orbit, the sun, planet, and earth being then nearly in a line. Under present conditions—and they will last for the next thousand years—transits are coupled, a June pair separated by eight years being succeeded, after a lapse of 105½ years, by the first of a December pair, while the corresponding interval from a December to a June transit is 121½ years. The motion of the planet on the sun, as viewed from the earth, is from east to west (left to right), and occupies, when the path pursued is central, just eight hours.

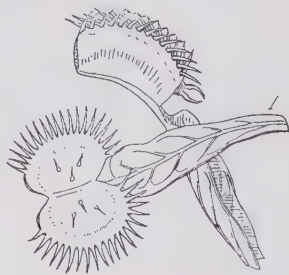
The first recorded transit of Venus was that observed by Horrocks and Crabtree on December 6, 1639; the companion event in 1631 had escaped notice. The next pair took place at the opposite node in June 1761 and 1769, and excited world-wide attention; for Halley had, meanwhile, in 1679, pointed out the availability of these occurrences for determining the distance of the sun. The results discussed by Encke yielded a value of 95,000,000 m. for the astronomical unit, and though it proved largely erroneous, its definitive correction was confidently undertaken on the occasions of the December transits of 1874 and 1882. But the outcome was virtual failure, the required degree of accuracy being rendered unattainable by irremediable optical difficulties. The next pair of transits are due on June 8, 2004, and June 6, 2012.

Venus, the ancient Roman goddess of love; such, at least, she became after her identification with the Greek Aphrodite. Originally she appears to have been a goddess of gardens. After the introduction of the worship of Aphrodite of Eryx from Sicily, about 220 B.C., she was worshipped as Venus Genetrix, 'mother of living creatures,' and as Venus Victrix, 'who conquers the world,' and under other titles.

All the stories connected with Venus are adopted from Greek mythology; for these see APHRODITE. As the wife of Mars, the tutelary god of Rome, and the mother of Æneas, she was regarded in a special way as the mother of the Roman people.

Venusberg, in German legend, the mountain grotto in which the knight Tannhäuser found Venus and her court, and spent his days with her in a long debauch, till, satiated and filled with remorse, he sought Pope Urban at Rome, and begged absolution for his sin. It is generally identified with a hill near Eisenach in Thuringia.

Venus's Fly-trap, an insectivorous plant, a native of the sandy savannas of N. Carolina. The leaves are all radical, and they have the property of closing round insects which alight on them. The plant bears corymbs of white flowers with numerous stamens. This plant is seldom seen in a good state of cultivation any length of time after removal from its native haunts. It delights in full sunshine, with a very humid atmosphere. A round, hanging earthenware receptacle is most useful to grow it in, the bottom being carefully drained. Some chopped fibrous peat is placed above the drainage, when the plants are built in with live sphagnum moss. It is then hardly possible to give them too much water. If kept in the sun, the leaves take on a reddish tinge; but when grown in the shade, they are always green. See further under INSECTIVOROUS PLANTS.



Venus's Fly-trap.

1, Leaf open; 2, leaf closed on an earwig.

Venus's Looking-glass, a hardy herbaceous plant belonging to the order Campanulaceæ. It bears lanceolate leaves, and in July purple flowers. It is easily cultivated in ordinary garden soil.

Vera, AUGUSTO (1813-85), Italian philosopher, born at Amelia in Umbria; taught philosophy in France, resided in England from 1851 to 1860, and was appointed a professor of philosophy in Naples University (1862).

Among his works, which include translations of Hegel into French, are *Il Cavour e Libera Chiesa in Libero Stato* (1871), *Essais de Philosophie Hégélienne* (1864), *Introduction à la Philosophie de Hegel* (1855), and *Strauss et l'Ancienne et la Nouvelle Foi* (1873). See Mariano's *Augusto Vera* (1887).

Vera Cruz, tn. and chief seapt. of Mexico, on Gulf of Mexico, 240 m. E.S.E. of the capital. It is often visited by yellow fever, but much improvement is expected from a new system of drainage and waterworks. The harbour has been converted into a first-class port, with an area of nearly 500 acres. Pop. (1900) 29,164.

Veranillo, the short dry season near midsummer in intertropical America.

Verano, the name applied to the long dry season near midwinter in intertropical America.

Verapoli, tn., Travancore state, Madras Presidency, India, 9 m. N.E. of Cochin; the seat of a Carmelite mission, and of the vicar-apostolic. A large percentage of the population are Syro-Nestorians or Syrian Christians.

Veratrine, an alkaloid obtained from *sabadilla* seeds. It forms colourless crystals, that have a bitter taste and excite sneezing. It is used in medicine as an external application to produce local anaesthesia, but is an active poison if taken internally.

Veratrum, a genus of hardy herbaceous plants belonging to the order Liliaceæ. They bear terminal panicles of flowers, usually broad leaves, and a thick poisonous rhizome. They are easily grown in gardens, requiring a rich soil.

Verawal, seapt. tn. on s.w. coast of Kathiawar peninsula, Bombay Presidency, India, 40 m. N.W. of Diu. Pop. (1901) 16,775.

Verbascum. See MULLEIN.

Verbena, a genus of mostly American herbaceous plants belonging to the order Verbenaceæ. They bear usually dense terminal spikes of small flowers, with five-cleft calyxes and unequally five-cleft corollas. *V. officinalis*, the common vervain, is a British plant, common on waste ground; it bears slender spikes of small lilac flowers. *Aloysia citrodora*, the lemon-scented verberna, belongs to the same natural order.

Verbenaceæ, a natural order of herbs, shrubs, or trees, widely distributed over the warmer parts of the world. Among the genera are *Lantana*, *Verbena*, *Vitex*, *Clerodendron*, and *Tectoma*.

Verboeckhoven, EUGEN JOSEPH (1799-1881), Flemish painter, born at Warneton in W. Flanders, whose skill was mainly devoted to the delineation of peasant and animal life.

Chief works: *Sheep surprised by a Storm*; *Horses attacked by Wolves*; *Sheep in the Campagna*; *Souvenirs of Scotland*; *Eve and Lambs*, or *the Good Mother*.

Vercelli (anc. *Vercellæ*), tn., Novara prov., Piedmont, N. Italy, on r. bk. of Sesia, 37 m. S.W. of Milan; is a railway centre, and has corn and rice mills. Cotton and woollen goods, silks and machinery, are manufactured. The church of St. Andrea dates from the 13th century. There is a museum of Roman antiquities, and the cathedral library contains a 4th-century MS. of the gospels, and other valuable MSS.—*c.g. Vercelli Book*. Pop. (1901) 30,470.



Common Vervain (*Verbena officinalis*).

1, Calyx; 2, corolla and pistil.

Vercelli Book, or **CODEX**, a manuscript in the cathedral library at Vercelli, was early in the 19th century conjectured to be an Old English MS. Its contents of the Codex are these: (1) Homilies, (2) *Andreas*, (3) *Fates of the Apostles*, (4) Homilies, (5) *Address of the Soul to the Body* (fragment), (6) *Falsehood of Men* (fragment), (7) *Dream of the Rood*, (8) Homilies, (9) *Elene*, (10) *Life of Guthlac*, in prose. All but the homilies and No. 10 are in verse. Cynewulf was the author of Nos. 3 and 9. The handwriting is of the 11th century. The poems of the Vercelli Codex occupy the Grein-Wülker's *Bibliothek* II. i. See Wülker's *Grundriss*.

Vercingetorix, an ancient Gaulish chieftain of the tribe of the Arverni, who in 52 B.C. raised a rebellion against Caesar. At first he gained several victories over the Romans, but finally was shut up in Alesia, and taken prisoner on its capture. He was kept to adorn Caesar's triumph in 45, and was then executed.

Verde, CAPE. See CAPE VERDE ISLANDS.

Verde-antique includes all the varieties of green serpentinous marble (or ophicalcite) which were prized as ornamental stones by the ancient Romans. Green Connemara marble is an essentially similar rock. The ancient supplies were mostly drawn from Greece and Italy.

Verden, tn., Hanover, Prussia, on the Aller, 22 m. by rail E.S.E. of Bremen; has manufactures of cigars and soap. Its Gothic cathedral dates from the 13th century. Pop. (1900) 9,842.

Verdi, GIUSEPPE (1813-1901), Italian operatic composer, born at Roncole, near Busseto, in the duchy of Parma. He became organist at Busseto in 1833, but five years later returned to Milan, where his first opera, *Oberto* (1839), was produced. It was the success of his fourth opera, *I Lombardi* (1843), which established his reputation. Of his twenty-eight operas perhaps the best known are *Rigoletto* (1851), *Il Trovatore* (1853), *La Traviata* (1853), *Aida* (1871), *Otello* (1887), and *Falstaff* (1893), a comic opera. His earlier operas were composed in the traditional Italian style, but in his later and much greater works the influence of the romantic school is clearly shown. His chief important non-operatic work is a *Requiem Mass* (1874). See the article in Grove's *Dictionary of Music*; also Pougin's *Life of Verdi* (1887).

Verdict, the determination of a jury at a trial, declared to a judge by the foreman of the jury. A verdict is called 'general' when the jury simply return a verdict of guilty or not guilty, or in a civil case a verdict for the plaintiff with damages, or for the defendant; and a jury may always refuse to give a special verdict, in which the jury find particular facts to be so, and leave it to the judge to apply the law to such facts. The verdict of a jury must be unanimous, except in civil actions where the parties agree to accept the verdict of a majority. The judge is not bound to accept a verdict tendered by a jury; he may instruct them to reconsider it, and if on reconsideration they bring in a different verdict, that last tendered is their true verdict. In criminal cases defects of imperfect statement of averments in support of indictments are cured by the ver-

dict. It is within the power of the judge at the trial of a civil action to enter judgment *non obstante veredicto* if the finding appears to him substantially contradictory to law, and it is a question for the appellate court whether a verdict is so much against the weight of evidence as to give occasion for a new trial. A verdict is called perverse where the jury refuse to follow the judge's direction as to the law. In Scotland a verdict may be the verdict of the majority of fifteen jurors in a criminal case, but in civil cases the jury of twelve must deliberate three hours before they may deliver a majority verdict. In criminal cases the verdict should be 'guilty' or 'not guilty.' The verdict of 'not proven,' in Scotland, has the same legal effect as that of 'not guilty.' In civil trials, when the jury are equally divided the juror first sworn has a casting vote. Special verdicts are very uncommon in Scotland. For the verdict at an inquest see CORONER.

Verdigris, a mixture of basic acetates, prepared by the action of crude acetic acid on copper. It varies from blue to green, and is used as a pigment.

Verditer, a basic carbonate of copper, prepared by precipitating copper sulphate or oxychloride with sodium carbonate. It has a small application as a blue or green pigment, but is poisonous and liable to discoloration.

Verdun (anc. *Verodunum*), tn. and fortress of the first class, dep. Meuse, France, on r. bk. of Meuse, 35 m. by rail W. of Metz; has manufactures of hardware, leather, liquors, and confectionery. It has a 12th-century cathedral. Here in 843 was signed the compact which divided the kingdom of the Franks into three parts, and so gave rise to the future France, Germany, and Lorraine. Pop. (1901) 21,360.

Vere, SIR AUBREY DE. See DE VERE.

Vere, AUBREY THOMAS DE. See DE VERE.

Vere, SIR FRANCIS (1560-1609), English soldier, born probably at Crepping Hall, Essex. He fought in Holland under the Earl of Leicester (1585), and was knighted by Lord Willoughby (1588). Succeeding to the chief command (1589), Vere gained further distinction at Breda (1589) and Zutphen (1591). He took part in the Cadiz expedition (1596) and the islands voyage (1597). Back in Holland, he distinguished himself at Turnhout (1598), Nieuwpoort (1600), and Ostend (1601). He spent his last years in writing his *Commentaries*.

Vere, SIR HORACE (1565-1635), brother of the above, took part in the campaigns from 1590 on-

wards, was knighted at Cadiz (1596), surrendered Mannheim (1622), and was created Baron Vere of Tilbury (1625). See *The Fighting Veres* (1888), by Sir Clements R. Markham.

Vere, ROBERT DE, NINTH EARL OF OXFORD AND DUKE OF IRELAND (1362-92), a favourite of Richard II., and much mixed up with the history of his reign.

Vereeniging, tn., Transvaal, Brit. S. Africa, 33 m. s. of Johannesburg, and just over the Vaal, where peace was agreed upon between Boers and British (May 31, 1902).

Verevstschagin, VASSILI (1842-1904), Russian military painter, born at Cherepovets in gov. Nov-

position. Despite a certain meretricious element in his work, he has had great significance in Russian art. After the publication of Tolstoy's *War and Peace* he struck out a new style of work by following the author's method. His pictures were exhibited in Berlin in 1882, and two series in London—those dealing with the Russo-Turkish war in 1887, and later those dealing with Napoleon and his Russian campaign. His autobiography has been translated into English (1887). Verevstschagin perished in the *Petropavlovsk* outside Port Arthur on April 4, 1904. See *Academy* (1888), *Art Journal* (1885), and *Life*, in German, by Zabel (1900).

Cavalleria Rusticana (1893); *Under the Shadow of Etna* (1896).

Vergennes, CHARLES GRAVIER, COMTE DE (1717-87), French statesman, was born at Dijon. After the war of the Austrian Succession, Vergennes was sent as the French representative to the court of the elector of Trèves. In 1754 he was appointed ambassador at Constantinople, and incited the Turks to oppose Russian aggressions in Poland. In 1772 Vergennes aided in carrying out the *coup d'état* in Sweden, by which Gustavus III. made himself absolute. On the accession of Louis XVI. Vergennes was appointed



'Forgotten'—Picture by Verestchagin.

(Photo by Hanstaengl.)

gorod; studied under Gérôme in Paris. He was present with the Russian troops in the war against Bokhara (1867), and in the Russo-Turkish war of 1877; was in the Shipka Pass and at the siege of Plevna; and was secretary to General Skobelev during the negotiations of peace at San Stefano. Thereafter with the brush he preached peace by painting such terrible subjects as the *Pyramid of Skulls* and *The Street of Plevna*. In spite of his French training he remained Russian in outlook, and in fullness and crudeness of colour. His was a dramatic mind, which ceaselessly calculated clever effects in com-

Verga, GIOVANNI (1840), Italian novelist, was born at Catania in Sicily. He began with novels, which were reminiscent of French sensational fiction—e.g. *Storia di una Capinera* (1874), *Nedda* (1874), *Eros* (1875). In 1880 he found his true genre—simple tales, dealing with Sicilian village life, and presented with a truth and mastery that remain unrivalled (e.g. *La Vita dei Campi*, 1880). His *Cavalleria Rusticana* was arranged as a libretto for Mascagni's music (1890). In English have appeared *The House by the Medlar Tree* (with introduction by W. D. Howells, 1891); *Maestro Don Gesualdo* (1893);

(1774) successor to D'Aiguillon at the foreign office. On the outbreak of the war between Britain and her American colonies Vergennes decided to aid the Americans. The peace of Teschen in 1779, between Austria and Prussia, was a signal triumph of Vergennes's firmness and sagacity. In 1785 he aided Holland against Joseph II., who had attempted, in defiance of treaties, to open the Scheldt. A compromise was effected, and the treaty of Fontainebleau was made between the emperor and the Dutch. Pitt consented in 1786 to make with him the famous commercial treaty, which largely benefited both

Britain and France. See Mayer's *Vie Publique et Privée du Comte de Vergennes* (1789).

Vergil. See VIRGIL.

Vergil, POLYDORO (?1470-?1555), Italian historian, born at Urbino. Becoming secretary to the Duke of Urbino at Padua, he wrote two well-known books, *Proverborum Libellus* (1498) and *De Inventoribus Rerum* (1499). After being chamberlain to Pope Alexander VI., Vergil came to England as sub-collector of Peter's pence (1501), and was made rector of Church Langton, Leicestershire (1503). He became prebendary of Nonington (1507); prebendary of Brent, and archdeacon of Wells (1508); was naturalized (1510); and appointed prebendary of Oxgate, St. Paul's (1513). For offending Wolsey he was imprisoned for some months (1515). He edited the work of *Gildas* (1525); published *De Prodigis* (1526); while his famous (Latin) *History of England* appeared in 1534. Vergil returned to Italy about 1551. See Ellis's preface to *History of England*, published (1844-6) by the Camden Society.

Vergniaud, PIERRE VICTURIEN (1753-93), a chief of the Gironde, and one of the victims of Robespierre, was born at Limoges. 'Eloquent Vergniaud... most mellifluous, yet most impetuous of public speakers' (Carlyle's *French Revolution*, bk. v. ch. ii.). He was president at the condemnation of Louis XVI., and voted for his death. On May 31-June 2, 1793, the Girondist party was overthrown; and in spite of Vergniaud's eloquence, which 'drew tears,' all the leaders were sentenced to death, and on October 31 brought to the guillotine. See Vatel's *Vergniaud* (2 vols. 1875), and *Life*, in French, by Verdère (1866).

Veria, tn., vilayet of Saloniki, Turkey, 40 m. W. of Saloniki. As Berrhōa it was one of the oldest towns of Macedonia, and here Paul preached in 54 A.D. The Turks call it Karaferia. Pop. 8,000.

Verkhné-Dnieperovsk, tn., Ekaterinoslav gov., S. Russia, 34 m. W.N.W. of Ekaterinoslav city, near the Dnieper. Pop. (1897) 11,607.

Verkhoyansk, tn., Yakutsk prov., E. Siberia, on Yana R., 400 m. N.N.E. of Yakutsk. It is noted as being at the pole of greatest cold in the Asiatic continent, with a mean winter temperature of -55° F. Alt. 531 ft. Pop. (1897) 356.

Verlaine, PAUL (1844-96), French lyrical poet, born at Metz. From youth he was passionately devoted to the worship of beauty under all its forms. His earliest volumes—*Poèmes Saturniens*

(1866) and *Fêtes Galantes* (1869)—showed the influence of Baudelaire and the Franco-Sapphic school. He then formed a friendship with the poet Rimbaud, until a quarrel led Verlaine to aim a pistol at the other, for which he had to atone by two years' imprisonment at Mons. He left prison a devout Catholic. In 1881 appeared *Sagesse*, a series of reli-

Vermeer, JOHANNES, or JAN VAN DER MEER (1632-75), Dutch painter, was born at Delft, and was greatly influenced by Pieter de Hooch. His paintings are mostly portraits, genre pictures, landscape and town views; they are very rare and costly. Examples are in Amsterdam, Berlin, and Paris, and there is one at Windsor.



gious odes and lyrics, which take rank with the best work of Christina Rossetti. *Romances sans Paroles* (1874), *Jadis et Naguère* (1884), *Amour* (1888), *Parallèlement* (1889), *Bonheur* (1891) were his most notable succeeding works, all characterized by exquisite beauty both of thought and of rhythm, sound being wedded to sense in a marvellously subtle manner.

Vermes, a term used by Linnæus in zoological classification, but now abandoned. See WORMS.

Vermicelli, an Italian paste made of the same materials as macaroni, but manufactured in long, slender, solid threads. It is much used as food and in soups. See also MACARONI.

Vermifuges, or VERMICIDES. See ANTHELMINTICS.

Vermillion, a variety of mercuric sulphide, HgS. It is prepared either by subliming the black sulphide obtained on heating sulphur with mercury or by a wet process. In the latter, which is more economical, but does not yield so fine a product,



Types of Venation.

1. Inflexed venation (tulip tree). 2. Conuplicate (oak). 3. Plicate (lady's mantle). 4. Crumpled (primrose). 5. Circinate (sunflower). 6. Involute (violet). 7. Revolute (rosemary). 8. Convolute (cherry).

mercury and sulphur are gently heated in a solution of caustic potash, until the black sulphide first formed becomes converted into the red variety. Vermillion is a brilliant scarlet, very heavy solid, which when finely ground makes a beautiful and permanent pigment. It is commonly adulterated with ferric oxide, red lead, chalk, and gypsum; whilst 'vermilionettes,' which are chalk, etc., dyed with coal-tar colours, are sometimes substituted for it. Its purity can easily be tested by heating it, when it should completely sublime.

Vermont, one of the N.E. states of the United States of America, with an area of 9,565 sq. m. It was admitted to the union in 1791. The surface is in the main mountainous, with fairly well defined ridges, known as the Green Mts., running nearly N. and S., the greatest heights being between 4,000 and 5,000 ft. Connecticut R. flows along its E. boundary, and its W. boundary is in part made by Lake Champlain. The capital is Montpelier. Agriculture is the leading industry. Among the products are marble and stone, butter and cheese, paper pulp, flour, and lumber. Pop. (1900) 343,641. Foreign-born numbered 44,747.

Vermouth, a liqueur prepared chiefly around Turin, N. Italy, and in France. The Italian variety is usually obtained by distilling bitter white vermouth wines and sweetening with loaf sugar. The cheaper qualities are made

by macerating Pontic wormwood with grain spirit, pouring off the clear liquid, then adding orange wine and from 16 to 22 per cent. of sugar. In the French cusenier vermouth a number of bitter aromatic herbs are used in addition to wormwood. The alcoholic strength averages 19 per cent.

Vernal Grass, SWEET. See GRASSES.

Vernation, a term applied to the arrangement of the leaf within the bud of a plant. Commonly the leaf is rolled. Sometimes, however, as in the dock, rhubarb, and primrose, the vernation is 'crumpled'; or 'plaited,' as in the lady's mantle and wood sorrel. Yet other arrangements are seen in the rose, beech, hornbeam, and oak.

Verne, JULES (1828-1905), French author, was born at Nantes. In 1850 he produced a comedy in verse, *Les Pailles Rompues*; but he eventually confined himself to the writing of scientific and geographical romances, achieving a great reputation. Among these works were *Cinq Semaines en Ballon* (1863); *Voyage au Centre de la Terre* (1864), *De la Terre à la Lune* (1865), *Vingt mille Lieues sous les Mers* (1870), *Le Tour du Monde en quatre-vingts Jours* (1873), *Michel Strogoff* (1876), *La Découverte de la Terre* (1878), *Mistress Branica* (1891), *Clovis Dordent* (1896), and *Les Frères Kip* (1902).



Jules Verne.

Verner's Law, in philology. So far as Grimm's law expresses the relations between Indo-European and early Teutonic consonants in words genealogically connected, its principal results may be exhibited as follows:—

Indo-European.	Early Teutonic.
<i>p, t, k</i>	<i>f, th, kh(h)</i>
<i>b, d, g</i>	<i>p, t, k</i>
<i>b-h [φ]</i>	<i>bh [b]</i>
<i>d-h [θ]</i>	<i>dh [d]</i>
<i>g-h [χ]</i>	<i>gh [g]</i>

B-h is *b+h*, whereas *bh* represents spirant *b*. (See PHONETICS.) The letters in brackets in the first column are the Greek modifications of the Indo-European aspirates, those in the second the Low German corresponding series. It was soon observed, however, that the Teutonic consonants *f*, *th*, and *h* by no means always corresponded to the Indo-European group *p, t, k*. In many cases the voiced spirants *bh, dh*, and *gh*, represented in Low German by *b, d*, and *g* respectively, took the place which Grimm's law assigns to *f, th*, and *h*. Verner's law, published in 1877, explains this by reference to the Teutonic word accent. When the syllable preceding the consonants in question is accented, Grimm's law applies; but where the accent falls on the following syllable, *f, th*, and *h* first become *bh, dh*, and *gh*, and finally, in Low German, *b, d*, and *g*. Thus Indo-European *t*, preserved in Latin *tres*, becomes, according to Grimm's law, *th* in English *three*, but the Indo-European *t*, preserved in *altus*, by Verner's law becomes *d* in English *old*. Verner's law throws light on many of the consonantal changes in Teutonic verbal forms—e.g. Indo-European *k*, preserved in Latin *duco*, becomes *h*, according to Grimm's law, in German *ziehen*, but is represented by *g* in the participle *gezogen*. In English, modern phonetic change has largely obliterated the operation of Verner's law, but it is quite clear in Anglo-Saxon. This same law also accounts for the change of original *s* into Teutonic *z* (replaced in English by *r*). See Skeat's *Principles of English Etymology* (First Series, 1887), ch. ix., and Victor Henry's *Grammaire Comparée de l'Anglais et de l'Allemand* (1893).

Vernet, a family of French painters. CLAUDE JOSEPH (1714-89) was born at Avignon. He painted the chief seaports of France.—ANTOINE CHARLES HORACE, his son, known as Carle Vernet (1758-1835), was born at Bordeaux. He won the Grand Prix de Rome in 1782, and in 1788 was elected a member of the Academy. He was widely known as an animal painter, and executed some large Napoleonic battle-pieces.—EMILE JEAN HORACE (1789-1863), his son, was born at Paris. He also was known for his battle-pieces—Jemappes, Valmy, Friedland, Wagram, Jena,

Fontenoy; but produced also many genre pictures, Algerian and Biblical subjects, and portraits. He was director of the French School of Art at Rome (1828-35). See *Lives* of all three, in French, by Durande (1865).

Verney, SIR EDMUND (1590-1642), standard-bearer (1626) to Charles I. He was returned to Parliament as member for Buckingham (1624), Aylesbury (1628), and Chipping Wycombe (1640). After the battle of Edgehill (1642) his severed hand was still found

turn he was imprisoned by Cromwell (1655). At the coronation of Charles II. he received a baronetcy. As member of Parliament for Buckingham he withstood the attacks of Judge Jeffreys on electoral rights (1685). See *Verney Memoirs* (1892-9).

Vernier, an auxiliary scale, invented by Pierre Vernier (1580-1637), which enables us to read the very smallest divisions of a graduated scale. It is indispensable in theodolites, sextants, and all mountings of telescopes

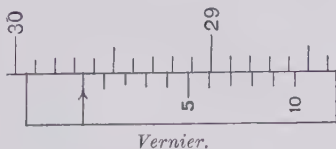
that, as the eye passes down the vernier from the zero mark, each successive vernier line gets nearer to the corresponding scale line by $\frac{1}{10}$ of the small scale division—that is, by $\frac{1}{100}$ of an inch. At length we come to a line (the seventh in this case) which exactly corresponds with the line on the scale. Hence we know that the zero line is $\frac{7}{10}$ above the scale line next below it. Thus the height of the vernier zero, which may be supposed to indicate the height of a barometer, is 29.67 inches.



A Picture by Horace Vernet—'The Siege of Constantine.' In the Palace of Versailles.

grasping the standard.—SIR EDMUND (1616-49), his third son, served in the Scottish war (1639), and in Flanders and in Scotland (1640). With his father he fought for the king in the civil war, served in Ireland (1642), and was slain on the capture of Drogheda by Cromwell (1649).—SIR RALPH (1613-96), eldest son of Sir Edmund (1590-1642), was M.P. for Aylesbury (1640), and sat on Strafford's trial. He adopted the cause of Parliament in the civil war. Refusing to sign the Covenant (1643), he went abroad for ten years, and his estates were sequestered (1646). On his re-

for accurate determination of angular positions; also in barometers, cathetometers, and other instruments for measuring length.



Vernier.

In the diagram is given an arrangement in which ten vernier divisions occupy the length of $\frac{9}{10}$ of an inch; and it will be seen

Vernon, EDWARD (1684-1757), English admiral, born in Westminster. In 1739 he was given command of an expedition against the Spanish possessions in S. America, and especially against Porto-Bello, which place he took with a very small squadron. In 1745 he was promoted to be an admiral, but in the following year he was dismissed the service, on a charge of having published two pamphlets containing letters which he had received from the ministry and the Admiralty. He was an officer of bravery and ability, but of intolerant temper in his dealings

with his professional superiors. He introduced into the navy the practice of serving out rum mixed with water instead of neat rum. The mixture became known as 'grog,' Vernon having gained the nickname of 'Old Grog' from his habit of wearing a grogram coat.

Vernonia, a genus of mostly tropical plants belonging to the order Compositæ. They bear usually purple flower-heads, the florets being all equal and five-cleft.

Verocchio. See VERROCCHIO.

Verolanium, or VERULAMIUM, the Latin name of an ancient British city, probably the residence of Cassivelaunus, which Julius Caesar captured. It is now

dence of the court; Theodoric used to stay there. It possesses a Roman amphitheatre, also a few remains of a theatre, an ancient gate, and wall of Gallienus, erected in 265 A.D.

Veronese, PAUL, the cognomen of PAOLO CAGLIARI (1528-88), Venetian painter of processional, ceremonial, and festival pictures, born in Verona. He settled in Venice in 1555. Through Titian's influence the Senate commissioned him to assist in decorating the ducal palace (destroyed in the fire of 1579). His greatest work is the decoration of the church of S. Sebastiano. The Venice Academy, the Brera, Madrid, Turin, Vienna, Dresden,

ing to the order Scrophulariaceæ. The flowers are usually borne in axillary or terminal racemes, and range in colour through the blues, purples, and white. Several species occur native in Britain, notably the beautiful blue-flowered germander, speedwell, or bird's eye (*V. chamædrys*). Other British species are the decumbent *V. officinalis*, which bears slender racemes of lilac flowers in summer; and *V. spicata*, which bears spikes of bright blue flowers in August.

Veronica. One of the women of Jerusalem who followed Jesus on his way to crucifixion (Luke 23: 27), taking pity on His fainting condition, wiped the sweat



A Picture by Paul Veronese—'The Family of Darius at the feet of Alexander.'

(Photo by Ilanstaengl.)

Old Verulam, near St. Albans in Hertfordshire.

Verona, fort. city and cap. of prov. of same name, Venetia, Italy, on the Adige, 72 m. by rail w. of Venice; has manufactures of nails, pianos and organs, cotton and silk goods, paper and flour, and trade in fruit, wines, and marble. The Gothic cathedral dates from the 12th century, and contains a fine *Assumption* by Titian; the very fine Romanesque church of San Zeno Maggiore stands in the w. corner of the city. Verona was originally a Celtic foundation, but became a Roman colony with the title of Augusta. It was the birthplace of the poet Catullus. In the later empire it was often a resi-

Munich are rich in his work, while the National Gallery, London, owns among others his most representative picture, *Family of Darius before Alexander*. Veronese stands in the forefront of great colourists: he ever sought to master the truths of light and shade as associated with colour; the relation of visible things to one another, and to their environment in light. He had all the joyous grasp on the aspects of life that characterized the Venetians, but preserved throughout the silvery tones of the Veronese school. See Cagliari's *Paolo Veronese* (1888), and *Modern Painters*, by John Ruskin.

Veronica, a genus of herbaceous and shrubby plants, belong-

from His face with her handkerchief. The napkin is said to have retained the imprint of the Holy Face, and has been preserved since the year 700 in St. Peter's at Rome. Its possession has also been claimed by Milan and other places. The name is said to be a corruption of *vera icon*, 'true image.'

Verres, GAIUS, Roman administrator. In 82 B.C. he was quaestor. In 74 he was city praetor, and then governed Sicily for three years (73 to 71 B.C.). Apart from his tyranny and oppression, his rapacity was such that he is said to have done more harm to the island than the two slave wars or the old war between Carthage and Rome. Every statue

or object of art of any value was seized by him. On his departure the Sicilian people besought Cicero to prosecute him for extortion. He was condemned, and retired to Marseilles, and in 43 was proscribed by Mark Antony, who was envious of his art treasures.

Verri, ALESSANDRO, COUNT (1741-1816), Italian writer, was born at Milan. He settled at Rome in 1767. He wrote novels based on the lives of Sappho and Herostratus, the *Vicende Memorabili de' suoi Tempi* (ed. 1858), and, above all, the *Notti Romane al Sepolcro degli Scipioni* (1792; 2nd ed. 1804). This glorification of Rome was at one time much admired (Eng. trans. 1825). Verri's best works appeared as *Opere scelte* at Rome in 1822, with biography by Maggi.

Verri, PIETRO (1728-97), Italian writer, brother of the

the sacristy of San Lorenzo, the mausoleum of Giovanni and Pietro de' Medici; and in 1476 *Young David*, now in the National Museum of Florence. Among his other works are the bas-relief of the *Decapitation of John the Baptist*, the bronze equestrian statue of Colleoni (at Venice), the silver altar in the baptistry of San Giovanni, the group of the *Unbelief of St. Thomas* in the oratory of San Michele, and the tomb of Bruni in Santa Croce. His most celebrated pupil was Leonardo da Vinci.

Versailles, French tn., dep. Seine-et-Oise, 11. m. s.w. of Paris. It is essentially a show place, and its great sight is the famous palace of Louis XIV., said to have cost £40,000,000, surrounded by imposing but stiff and artificial grounds. The palace contains pictures by Boucher,

or by quantity. The verse in turn consists of a certain number of these feet grouped in definite order, on the conclusion of which the writer turns back and repeats the same or a closely related group. As the following verse or verses may vary slightly from the original pattern, so as to form what is strictly termed a stanza, the word verse is sometimes stretched to cover this more elaborate grouping, which is then taken as the principal metrical unit. This application of the term is, however, an inadmissible usage. Further, verse is commonly considered as synonymous with metre in general, and as the antithesis to prose, in which the rhythm of the language is not restricted according to any prearranged pattern. And by a not unnatural confusion of thought, a still further



The Palace of Versailles.

foregoing, was born at Milan. Besides contributing to *Il Caffè*, he wrote *Meditazioni sull'Economica Politica* (new ed. 1853), with monograph by Ferrara. He also wrote the history of his native city to the year 1564 (continued by Frisi, Custodi, and Magri, 1783-98), a work still highly esteemed. Editions of Verri's selected works appeared at Milan (1835), with biography by Custodi; and at Florence (1857), under the care of Carcano, with biography by Salvagnoli. An admirable monograph is that by Bouvy (1890). See too the brothers' *Lettere e Scritti Inediti* (ed. by Casati, 1879-80).

Verria. See BERGA.

Verrocchio, ANDREA DEL (1435-88), the name assumed by Andrea de' Cioni, Florentine goldsmith, sculptor, architect, and painter; worked under Donatello. In 1471 he executed in bronze, for

Vanloo, Watteau, David (illustrating Napoleon's career), Delacroix, and Vernet. Here Marie Antoinette faced the raging mob of the revolution in 1789; here, in 1871, William of Prussia was proclaimed German emperor; and here, in the same year, the capitulation of Paris was signed. The town, of a grandiose character, is very regularly and spaciouly laid out, and is the seat of a bishopric. In Versailles were born Louis xv., Louis xvi., and Louis xviii., Generals Hoche and Berthier, and the Abbé de l'Épée. Pop. (1901) 44,563.

Verse, the principal unit by which metrical compositions are measured. Generally speaking, it is equivalent to what we term commonly the line. The elementary unit of metrical compositions is the 'foot'—i.e. a little group of one or more syllables measured either by accent

extension of the term makes it equivalent to poetry and the poetical. But verse is only an accidental accompaniment of poetry. Nevertheless, it is certainly true that poetry instinctively assumes a metrical form and expresses itself in verse. In what way, then, does verse aid in the expression of the poetical? It does so by establishing a certain definite form of rhythm, and thus apprising the hearer beforehand of the particular musical effect he is to look for. We naturally expect in imaginative or emotional speech a rhythm elevated above that of common life, and in imaginative prose this elevated rhythm is so extremely varied in character that the mind is kept constantly on the alert to catch it. In fact the strain on the attention is so great that prose cannot long remain at this height without becoming wearisome. In verse, on the other

hand, this variety of cadence is restrained within clearly defined limits, and the mind is enabled to concentrate its attention on the subtle changes of harmony within those limits. The grammatical rules for quantity and accent, and the laws of versification, are known as prosody. See POETRY.

Versecz, tn. and episc. see, Temes co., Hungary, 45 m. by rail s. of Temesvár; has sawmills and breweries, and is noted for red wine and brandy. Pop. (1900) 22,199.

Verst, a Russian measure of length, equal to '663 of an English mile.

Vertebrates, or back-boned animals, as first defined by Lamarck, are those in which there is a dorsal axis, consisting of a chain of vertebræ. But the term chordates is preferable, because it is the notochord, not the backbone, which is the supremely important structure; but as vertebrate is a well-established term, it is customary to use it as synonymous with 'chordate.'

Vertigo, or the sensation of giddiness, is a disturbance of the function of equilibration or balancing. The more common causes of the condition are associated with disorders of the eyes and ears. Ocular vertigo is frequently due to a slight squint. Auditory vertigo (synonym, Ménière's disease), or labyrinthine vertigo, is the result of derangement of the semicircular canals of the ear. Vertigo, however, may be due to central nervous disorder, and to derangements of the digestive system. The giddiness associated with sea-sickness is one of the most distressing features of that affection. Severe hemorrhage or any other condition which produces cerebral anæmia is apt to cause vertigo, which also follows the use of certain drugs, such as tobacco, alcohol, and quinine. The treatment must depend entirely upon the cause.

Vertue, GEORGE (1684-1756), English antiquary and engraver, born in London. While working under Sir Godfrey Kneller he achieved fame as an engraver, and in 1730 issued his set of *Twelve Heads of Poets*. After his death his antiquarian notes were bought by Horace Walpole, and were extensively used by him in compiling his *Anecdotes of Painting in England* (1762-71).

Verulam, tn., cap. of Victoria co., Natal, British S. Africa, 18 m. N.E. of Durban; is a centre of the sugar industry. Pop. (1904) 1,325.

Verulam, BARON (1561-1626). See BACON, FRANCIS.

Verus, LUCIUS AURELIUS, the colleague of Marcus Aurelius in the empire from 161 to 169 A.D., was adopted by Antoninus Pius.

Verus, however, was of an indolent and pleasure-loving nature, and did not aid M. Aurelius greatly, though from 162 to 165 A.D. he carried on a successful war against the Parthians. Afterwards he fought against the Quadi in the Marcomannic war.

Verviers, tn., Liège prov., Belgium, 14 m. E.S.E. of Liège; long noted for woollens, and has manufactures of woollen yarn. Pop. (1900) 49,168.

Vesalius, ANDREAS (1514-64), Flemish anatomist, was a native of Brussels. From 1537 he lectured on anatomy at Basel, and at Padua and other Italian cities, and in 1544 was appointed physician to Charles V., afterwards to Philip II. of Spain. Accused of having opened the body of a Spanish nobleman before life was extinct, he was forced to take a journey to the Holy Land in expiation of the offence. On his way back to Padua, to occupy the chair of medicine, he was shipwrecked on the island of Zante, where he died of hunger and hardship. His great work is *De Corporis Humani Fabrica* (1543; best ed., by Boerhaave and Albinus, 1725). See *Life*, in German, by Roth (1886).

Vesicants. See BLISTER.

Vesicaria, a genus of herbaceous plants belonging to the order Crucifere. They bear mostly large flowers, yellow or purple in colour.

Vespasian (9-79 A.D.), whose full name was Titus Flavius Sabinus Vespasianus, emperor of ancient Rome from 69-79 A.D., was born near Reate in the country of the Sabines. In 43 he commanded the second legion under Aulus Plautius in Britain, and reduced the Isle of Wight (about 47 A.D.). In 51 he became consul, and was proconsul of Africa under Nero, and in 66 governor of Judæa. In 69 Vespasian was proclaimed emperor at Alexandria by his own troops. The first events of his reign were the suppression of the revolts of the Batavians, the Gauls, and the Jews. The capture of Jerusalem by Vespasian's son Titus, in 70, ended the last rebellion; and after his return to Rome and his joint triumph with his father, the temple of Janus was closed: Vespasian had restored peace to the Roman world. In his reign the conquest of Britain was continued; the dependent kingdom of Commagene was united to the province of Syria; and M. Ulpius Trajanus, father of the emperor, repelled a Parthian invasion of Syria. Vespasian's great task was to restore the finances of the state; he also found money for the new temple of Jupiter on the Capitol, a magnificent temple of Peace, and the vast Flavian amphitheatre commonly known as the Colosseum. But he was forced to increase existing taxes, and to introduce new ones, and so was accused of avarice and parsimony. Personally he set a noble example of simplicity and economy in his own living. In fact his reign began a new era of the empire: the old Julian line with its magnificence had gone, and the new emperors were content to live as citizens. He died standing on his feet, as he said an emperor should.

Vespers (Lat. 'evening'), or EVENSING, the sixth and second last of the canonical hours in the Anglican, Roman Catholic, and Greek Church services. See BREVIARY.

Vespucci, AMERIGO (1451-1512), whose name was conferred on America, was born at Florence. In 1496 he was sent to Seville as factor for a mercantile firm. Interested in Columbus's third venture, he sailed across the Atlantic in 1499, exploring the coast of Venezuela. In 1503 he discovered All Saints' Bay, Brazil. In 1508 he was made pilot-major of Spain.

Vessels, SPECIAL TYPES OF. See FERRY BOAT; ICE-BREAKER; OIL VESSEL; TURBINES; STEAM YACHTS; also FLOTATION.

Vesta, the fourth and brightest asteroid, discovered by Olbers on March 29, 1807. It revolves in a period of 1,326 days, at a mean distance from the sun of 219 million miles. Vesta alone among the asteroids is visible to the naked eye.

Vesta, in ancient Roman mythology, the goddess of the hearth, corresponding to the Greek Hestia. As the goddess of the home life her temple stood in the Forum, and contained the sacred fire which Æneas was believed to have brought from Troy. This fire was watched by the vestals: if by any mishap it was allowed to go out, it could only be relighted by the *pontifex maximus*, through the friction of two pieces of wood. Hers was the last form of heathen worship to give way before Christianity.

Vestals, or VESTAL VIRGINS, maidens who at ancient Rome guarded the temple of Vesta and its sacred fire. Their institution is referred to Numa, who appointed four, a number afterwards raised to six, and never altered. Their period of service lasted for thirty years, during which they were bound by a vow of chastity. After the period was over they could renounce their vows, return to the world, and marry. Wills were entrusted to their keeping, and even treaties. But a lapse from chastity was punished by burial alive. Their institution ended in 394 A.D., when Theodosius II. closed the temple.

Vesteraalen. See LOFOTEN ISLANDS.

Vesterås, tn., cap. of Swedish prov. of Vestmanland, on a branch of Lake Mälär; has a cathedral dating from 1300, a castle, and a bishop's palace. Here, on April 29, 1521, Gustavus Vasa and his Dalecarlians defeated the Danes. Pop. (1900) 11,999.

Vesting Order, an order generally made by a judge of the Chancery Division; its effect is to vest real or personal property in the persons named in the order without the operation of a conveyance or assignment. It is usually employed in cases where trustees are appointed by order of the court, and it is impossible to convey the estate to them in any ordinary way. The procedure is under the Trustee Act, 1893. The judge in lunacy may also vest the lunatic's property in his committee under the Lunacy Act, 1890, and the Charity Commissioners can make vesting orders under the Charitable Trusts Acts.

Vestments. The clerical vestments which were worn throughout the whole church until the reformation, and which are to a certain extent in use in the Anglican Church, were probably derived from the ordinary dress of Romans and Orientals. Thus the alb is the ancient tunic; the dalmatic was used by the Roman emperor; so also the cope, and so on. The *Rationale of the Ceremonies to be used in the Church of England, with an Explanation*, by Archbishop Cranmer, explains the vestments in use at the celebration of the Holy Eucharist. When renewed interest in the ritual of the church was excited in 1830, certain ritualists adopted the chasuble over an alb, their action gaining apparent support from a decision of the Judicial Committee of the Privy Council in 1857, that 'the same dresses which were used under the first Prayer Book of Edward VI. may still be used.' Much litigation followed. In 1870 Sir R. Phillimore gave judgment in similar terms to that of 1837; his decision was, however, reversed by the Privy Council in 1871. It was then, and again in 1877, declared that all vestments except the surplice were illegal in the Church of England. This pronouncement has been considerably modified by the declaration of the archbishop of Canterbury in the case of the bishop of Lincoln (Dr. King). (See LINCOLN JUDGMENT.) Vestments prescribed by canon to be worn by officiating clergy are often termed canonicals.

Vestris, MADAME (1797-1856), English actress, was born in London, and married Armand Vestris, a French ballet-dancer,

but separated from him after a short union. She appeared on the Paris stage in 1816, and later (1820) became famous at Drury Lane. In 1838 she married Charles James Mathews.

Vestry, the meeting of the inhabitants of a parish for the election of parish officers and the settlement of parish affairs. In a few parishes there is a custom to elect vestrymen to represent the parishioners, thus forming what is called a select vestry. Under 1 and 2 Will. IV. c. 60, which is an adoptive act, parishes having at least 800 ratepayers were enabled to obtain a select vestry. There are said to be only eight parishes where this act is in force. In all rural parishes the non-ecclesiastical powers of the vestry have been transferred to the parish council, or the parish meeting, by the Local Government Act, 1894. In the county of London, in which vestries were in many cases the local authority, they have been superseded by the borough councils under the London Government Act, 1899.

Vesuvianite. See IDOCRASE.

Vesuvians. See MATCHES.

Vesuvius, a volcano in Italy, S.E. of Naples. Its height is 4,020 ft. In 340 B.C. the decisive battle between the Romans and the Latins was fought probably on its northern slopes; in 73 B.C. Spartacus and his fugitive slaves made it their stronghold. On Aug. 24, 79 A.D., it broke into the eruption (described in a letter of Pliny the Younger to Tacitus) which overwhelmed Herculaneum, Pompeii, and Stabiae. In this eruption Pliny the Elder perished at Stabiae. Other eruptions took place in 203, 472, and 512 A.D. In 1611 the mountain was covered by forest, and even the crater was overgrown with shrubs, but these were swept away by an outbreak in 1631. In the 18th and 19th centuries its activity was much greater, especially in the years 1766, 1779, 1794, 1822, 1855, 1871, and 1906. Observations have been kept upon the mountain from an observatory built at the foot of the crater in 1844, and conducted from 1854 to 1882 by Professor Palmieri, and now by Professor Matucci. Since 1880 a wire-rope railway has carried visitors close to the edge of the crater. The grapes grown on its slopes produce excellent wine—e.g. *lachryme Christi* and *vino greco*. See Palmieri's *Il Vesuvio e la sua Storia* (1880), J. S. Lobley's *Mount Vesuvius* (1889), and Lytton's novel *Last Days of Pompeii*.

Veszprim, cap. of prov. of same name, Hungary, 69 m. S.W. of Budapest; has coal mines and

iron works. It has a castle and an episcopal palace; its Gothic cathedral dates from the 16th century. Pop. (1900) 14,114.

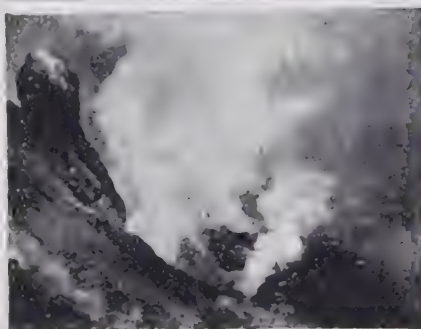


Vetch, or Tare (Vicia sativa).

1, Standard; 2, keel; 3, wing; 4, calyx.

Vetch, or TARE (*Vicia sativa*), a leguminous plant of creeping habit, furnished with tendrils, and largely cultivated for fodder. It is indigenous to Britain, and is closely allied to many wild species, such as *V. sylvatica*, wood vetch; *V. cracca*, tufted vetch; *V. lutea*, yellow vetch. Vetches usually occupy the fallow breadth of arable land, and, after consumption, may be followed by late roots, or the ground may be half-fallowed or rag-fallowed for wheat. The plant thrives best upon chalky or calcareous soils, but is also well adapted for clays, as it can be folded by sheep during the dry season of the year. By distributing the sowings a succession may be kept up from May to October. Vetches are occasionally ploughed in as green manure.

Veterinary Service, of the army, consists of a director-general at the War Office, 12 administrative officers, and 140 executive officers. The veterinary service of the army was first organized in the early part of the 19th century, when a veterinary surgeon was appointed to every regiment of cavalry and a few to the artillery. Subsequently a departmental organization was created, the regimental system existing simultaneously. In 1878



Mount Vesuvius: the Eruption of 1906.

1. Boscotrecase after the eruption. 2. View near the crater. 3. Volcanic dust near the cone. (Photo by Abénicar.) 4. Scene near Boscotrecase. (Photo supplied by the Illustrations Bureau.) 5. The crater. (Photo by Abénicar.) 6. The mountain from the Bay of Naples.

all regimental veterinary surgeons were incorporated in the department. At present a veterinary executive officer is attached to every cavalry regiment and mounted corps or other organization of the regular army. Certain veterinary officers are also employed at the remount depôts. A veterinary school exists at Aldershot.

Farriers.—Two men from every squadron of cavalry of the line (one man from each squadron of the household cavalry), and men from the Horse and Field Artillery, the Royal Engineers, and the Army Service Corps, are always under instruction as shoeing smiths. The course lasts two years. From these shoeing smiths the farrier-corporals and farrier-sergeants are selected, and these in their turn provide regimental farrier quartermaster-sergeants.

Veterinary Science. The founder of veterinary medicine was the Roman writer Vegetius, who lived about 300 A.D. France founded the first veterinary college at Lyons in 1761, and the second at Alfort, near Paris, in 1766. The Royal Veterinary College in London was founded in 1790 by St. Bel, a Frenchman. In Edinburgh Professor Dick established a veterinary college in 1819, and in 1873 the New Veterinary College in Edinburgh and in 1861 the Glasgow Veterinary College were founded; while quite recently veterinary colleges have been instituted in Dublin and in Liverpool. With the exception of the Dublin College, the British schools receive no state aid. The course of study in these schools extends over four years. Four professional examinations must be passed (one at the end of each period of study) before the degree can be obtained. The Council of the Royal College of Veterinary Surgeons (a body elected by the profession) conducts all professional examinations, grants degrees (M.R.C.V.S. and F.R.C.V.S.), manages the internal politics of the profession, and maintains discipline among its members. The degree of fellowship may be obtained by graduates after being five years in practice, on passing a special examination. Veterinary medicine and surgery became recognized as a profession in 1844, when the Royal College of Veterinary Surgeons obtained its charter of incorporation. The Highland and Agricultural Society of Scotland granted veterinary certificates in Scotland, enabling graduates to practise in that country prior to 1881, when the Veterinary Surgeons Act was passed. In July 1900 holders of the Highland and Agricultural Society's certificate were, by the Veteri-

nary Surgeons Amendment Act, made amenable to the rules and regulations of the Royal College of Veterinary Surgeons. The proper inspection of meat and milk for human food, the housing and general sanitary condition of domesticated animals, the treatment of their diseases, the eradication of animal plagues, all require the skilled attention of veterinary surgeons. See further CATTLE, HORSES, PIGS, SHEEP—Diseases.

Veto, THE. The power of vetoing legislation passed by both houses of Parliament still theoretically resides in the sovereign of Great Britain, but it has not been exercised since 1707, when Queen Anne refused her assent to a bill for settling the militia in Scotland. The president of the United States is, by the constitution, vested with a direct veto. If he disapproves of a measure, he returns it, with a statement of his objections, to the house in which it originated. A meeting of the two houses is then held, and if the bill is passed by a two-thirds majority it becomes law. If it fails to obtain this majority, the bill is dead for the session. The French president cannot veto bills. For the power of veto possessed by the separate magnates of Poland, the exercise of which was one of the causes of that country's ruin, see POLAND.

Vetter, or WETTER, LAKE, Sweden, 75 m. long, 10 to 20 m. broad, 415 ft. deep, and 740 sq. m. in extent. It lies 270 ft. above sea-level, and is remarkable for frequent and sudden perturbations of its surface, and for its periodical rising and falling, its numerous currents, its mirages, its extraordinarily deep, cold, clear blue water, and its romantic shores. It is drained by the Motåla, and is joined to the Baltic by the Göta Canal.

Veuillot, LOUIS (1813–83), French journalist, editor, and author, was born at Boynes, dep. Loiret. After a visit to Rome in 1838 he returned to France an ardent supporter of Ultramontanism. As editor of the *Univers* he became the champion of the church. In 1842 he was made chief secretary to the minister of the interior. The *Univers* was suppressed from 1860 to 1867, owing to its attacks on Napoleon III. Veuillot, among other writings, produced *Mélanges Religieux, Politiques, Historiques, et Littéraires*, in 18 vols. (1857–75).

Vevey, tn. in Swiss canton of Vaud, finely situated on N. shore of Lake of Geneva, 11 m. S.E. of Lausanne; it is much frequented by visitors. Pop. (1900) 11,915.

Vexatious Indictments. The Vexatious Indictments Act, 1859, which does not apply to Scotland,

limits the common law right of prosecution by private persons for criminal offences. The act, as extended by later acts, provides that no indictment may be presented against any person for perjury, subornation of perjury, conspiracy, false pretences, keeping a gambling house or a disorderly house, indecent assault, offences under Part II. of the Debtors Act, 1869, the Criminal Law Amendment Act, 1885, and the Merchandise Marks Act, 1887, unless the person presenting the indictment has made his charge before a court of summary jurisdiction, and has been bound over to prosecute, or the person accused is in custody or on bail, or unless the indictment is by order of a judge.

Vexjö, tn., cap. of Swedish co. Kronoberg, 60 m. W. by N. of Kalmar. Iron-founding and match-making are the chief industries. It has an ancient cathedral. Pop. (1900) 7,365.

Vezin, HERMANN (1829), American actor, was born in Philadelphia, U.S.A. He first appeared on the English stage at York in 1850, and in London in 1852, at the Princess Theatre, in the character of Pembroke (*King John*). His name is principally associated with Shakespearean parts, though he also made his mark as Dr. Primrose and Percy Pendragon. He is the author of *My Masters*, and has been successful as a teacher of elocution.

Viadana, LODOVICO (c. 1565–1645), whose real name was L. Grossi, Italian musical composer, born at Viadana, near Mantua. He successively held the appointments of musical director in the cathedrals of Mantua, Fano, Venice, and Mantua again. He was the first to employ thorough-bass in church music, was the inventor of the term *basso continuo*, and was one of the earliest composers of the monodic school, who used figured bass in writing instrumental accompaniments to vocal compositions.

Viaduct. See BRIDGE.

Via Mala, picturesque gorge of the Rhine, near Thusis, canton Grisons, Switzerland, is 4 m. long. The road and the river intertwine between limestone rocks some 1,600 ft. on either side. The first road was made in 1470; the present road, constructed 1818–24, forms the first part of the Splügen road.

Viardot. See GARCIA.

Viareggio, seaport and health resort, prov. Lucca, Tuscany, Italy, on the coast, 13 m. by rail N.W. of Pisa; has a monument to Shelley, whose body was washed ashore and cremated here to allow of the interment of the ashes in the Protestant cemetery at Rome. Pop. (1901) 17,240.

Viaticum, provision for a journey; a term used in the Roman Catholic Church for the last communion administered to those in *extremis*.

Viatica. See **VIATKA**.

Viau, or **VIAUD**, **THÉOPHILE DE** (1590-1626), French poet, born at Clairac, near Agen; went to Paris, where he attached himself to the Duc de Montmorency. His *Cabinet Satirique* forced him, as a Huguenot, to flee (1619) from Paris. Becoming a Roman Catholic, he wrote *Parnasse Satirique* (1623), a collection of poems of the same character as the *Cabinet Satirique*, and for which he was arrested, tried, and sentenced to death; but the sentence was commuted to banishment (1623). He wrote also *Pyrame et Thisbé*, a tragedy; and *Histoire Comique* (1621). The best edition of his *Œuvres Complètes* appeared in 2 vols. (1856).

Viaud, **LOUIS**. See **LOTI**, **PIERRE**.

Vibert, **JEHAN GEORGES** (1840-1903), French genre painter and dramatist, born in Paris; painted *L'Appel après le Pillage*, *La Tentation*, *Le Barbier Ambulant*, *Un Couvent sous les Armes*, *Le Départ des Mariés*, and *Le Premier-né*. He also executed *L'Apothéose de Thiers* for the Luxembourg, the *Bailli de Suffren* for the ministry of marine, the *Presentation* and the *Assumption* for the Chapel of the Virgin, and the *Annunciation* and *Mater Dolorosa* for the chapel of the law courts. As a dramatist he is known by his *Tribune Mécanique*, *Les Chapeaux*, *Les Portraits*, and *Le Vergeux*.

Viborg. (1.) Town, Jutland, Denmark, 37 m. N.W. of Aarhus. The cathedral dates from 1130-69. Another fine edifice is the Black Friars (13th century). In heathen times Viborg was the religious centre of N. Jutland, and the coronation city of the Jutland kings. Pop. (1901) 8,623. (2.) Town and fortress, Finland, N.W. Russia, capital of Viborg prov., 72 m. N.W. of St. Petersburg. It is an archiepiscopal see, with a cathedral (Russian Orthodox), an ancient Protestant church, a Swedish castle (1293), Russian, Swedish, and Finnish colleges, schools of navigation and commerce, and naval port. It manufactures machinery and soap, and has locksmiths' shops. There is an export trade in timber, iron, paper, tar, tallow, fish, butter, to the value of £400,000, and an import trade of £800,000. Pop. (1897) 23,472.

Vibrio, a name sometimes given to forms of bacteria in which the cell is spirally twisted. (See **BACTERIOLOGY**.) The name is also occasionally applied to some of the small nematodes.

Viburnum, a genus of hardy shrubs belonging to the order Caprifoliaceae. They bear corymbs or panicles of white or pink flowers, and many species are cultivated in British gardens. *V. opulus* is the well-known dog rowan tree or guelder rose. To this genus belong *V. lantanoides*, the American wayfaring tree, and *V. prunifolium*, the American black haw.

Vicar and Vicarage. When the rector of a parish is a layman, or a spiritual corporation, such as the dean and chapter of a cathedral, the incumbent of the parish church is generally a vicar, and his house a vicarage; but in some cases he is a perpetual curate. By an act of 1868 all incumbents, not being rectors, are entitled to the style of vicar, if they are authorized to publish banns in the church, and solemnize marriages, churchings, and baptisms, and to receive the fees for doing so.

Vice-Admiral's Courts may be established in any British possession by commission under the great seal. They have jurisdiction under the Merchant Shipping Act, 1894, and also with regard to piracy, the slave-trade, foreign enlistment, and prizes. They now also possess in the colonies, with certain exceptions, the jurisdiction of the Admiralty Division of the High Court in England. Appeals lie to the Privy Council.

Vice-Chancellor. The first vice-chancellor was appointed in 1813, to assist the lord chancellor and the master of the rolls in the courts of equity. Their appointment has been discontinued since 1873, and their place is taken by the judges of the Chancery Division. The last to retire was Sir James Bacon, in 1886.

Vice-Consul. See **CONSUL**, **MERCANTILE**.

Vicente, **GIL** (c. 1470-c. 1536), Portuguese dramatist, born probably in Lisbon. His first drama (a pastoral) was produced in 1502, and he subsequently wrote seventeen pieces in Portuguese, ten in Spanish, and fifteen in a mixture of the two languages. These include sacred pieces, comedies and farces, many reaching a high level of excellence. The first collected edition appeared in 1562; later ed. (1834) by Feio and Monteiro. See *Lives*, in Portuguese, by Braga (1898), Ouguella (1890), Sanches de Baena (1894), and Brito Rebello (1902).

Vicenza, **tn.**, cap. of prov. of same name, Venetia, Italy, on the Bacchiglione, 40 m. by rail W.N.W. of Venice; has manufactures of silk, woollen and cotton goods, bricks, and pottery. Its Gothic cathedral dates from the 13th century. Palladio, the architect, was a native. Pop.

(1901) 43,703. In the N. of the province, near the Austrian border, is the district of Sette Comuni, or the seven communes of Asiago, Enego, Foza, Gallo, Lusiana, Roana, and Rotzo. The inhabitants speak a German dialect.

Vicenza, **DUKE OF**. See **CAULAINCOURT**.

Vice-President. See **PRESIDENT**.

Viceroy, a title applied to an officer representing the supreme authority in a dependency, as the lord-lieutenant of Ireland, and (since 1858) the governor-general of India. The title was also officially given to the governors of certain dependencies of the old Spanish monarchy, such as Naples, Peru, and Mexico.

Vich (Lat. *Ausa*), **tn.**, Barcelona prov., Spain, 38 m. N. of Barcelona; has manufactures of hats, paper, and cotton goods. Its cathedral, rebuilt in 1803, occupies the site of an 11th-century basilica. Pop. (1900) 11,628.

Vichy-les-Bains (Lat. *Aqua Calida*), **tn.** and **wat.-pl.**, dep. Allier, France, on the Allier, 32 m. S. of Moulins; has been known since Roman times for its mineral springs. Bottled Vichy water is largely exported. Pop. (1904) 14,046.

Vicia, a genus of herbaceous plants belonging to the order Leguminosae. They bear usually bluish or yellowish flowers, followed by two-valved pods. Several species are natives of Britain, notably the common vetch (*V. sativa*), the bitter vetch (*V. orobus*), the wood vetch (*V. sylvatica*), and the common tare (*V. hirsuta*).

Vicious Intromission. See **INTROMISSION**.

Vicksburg, city, Mississippi, U.S.A., co. seat of Warren co., on the Mississippi; with cotton mills and railway workshops. The place was captured by General Grant, July 4, 1863. Pop. (1900) 14,834.

Vico, **GIAMBATTISTA** (1668-1744), Italian philosophical and historical writer, born at Naples. In 1697 he became professor of rhetoric, and in 1734 historiographer to the king of Naples. All his books lead up to the *Principi della Scienza Nuova d'Intorno alla Commune Natura delle Nazioni* (1725; better ed. 1743). By this work Vico became the founder of the philosophy of history. His *Opera* were edited by Ferrari, with the author's autobiography (6 vols. 1836-7). See monographs by Flint (1885), Cosentini (1895), and De Nicola (1900).

Victor, **CLAUDE PERRIN** (1764-1841), duke of Belluno and marshal of France, was born in the Vosges, and entered the French

army as a drummer boy in 1782, rising to be a general of division in 1797. He became governor of Batavia, ambassador to Copenhagen, marshal of France for his gallantry at Friedland (1807), and ambassador at Berlin. In 1808, in the Peninsular war, he beat the Spaniards; but in 1809 he found his superior in Wellington at Talavera. He then played an able part in the Russian campaign of 1812. In 1814 he quarrelled with Napoleon, and went over to the Bourbons, becoming minister of war (1821-3). See *Extraits des Mémoires Inédits de feu C. V. Perrin* (1846).

VICTOR, SEXTUS AURELIUS (fl. 370 A.D.), Roman historian, attracted the notice of the emperor Julian, who made him governor of a division of Pannonia. Theodosius gave him the office of city prefect, and in 373 A.D. he was the colleague of Valentinian in the consulship. He wrote *Cæsares*, short biographies of the emperors from Augustus to Constantius. It was edited by Schröter (1829-31). Other works reputed to be his are the *Epitome*, *Origo Gentis Romanæ*, and *De Viris Illustribus*; but they were certainly not written by this Aurelius Victor.

VICTOR AMADEUS. See SAVOY.

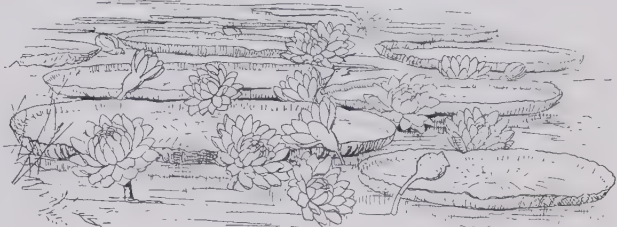
VICTOR EMMAUEL I. (1759-1824), king of Sardinia (from 1802). At first the French were in occupation of his continental dominions; but after the fall of Napoleon in 1814, he returned to Turin, and inaugurated a reactionary régime. This produced a revolution in 1821, and Victor Emmanuel abdicated in favour of his brother, Charles Albert.

VICTOR EMMAUEL II. (1820-78), king of Italy from 1849, ascended the throne after the defeat of the Piedmontese army by the Austrians at Novara. Aided by Garibaldi in Naples, Victor Emmanuel by the end of 1860 had created a new Italian kingdom. In 1866 he received Venice, though he was unable to secure that portion of Tyrol which he claimed. In 1871 he occupied Rome, and Italian unity was thus completed.

VICTOR EMMAUEL III. (1869), king of Italy, is the only son of Humbert I., and succeeded to the throne on the assassination of his father, July 29, 1900. He entered the army in 1887; was made lieutenant-general in 1894, and commanding-general at Naples in 1897. King Victor Emmanuel has given much attention to military studies, and has made frequent visits to the German army. He represented his father at the Russian court (1896), at St. James's (1897), and at the German court (1900).

Victoria, a genus of tropical American aquatic plants belong-

ing to the order Nymphæaceæ. There is but one species, the beautiful Queen Victoria water lily, water platter, or royal water lily (*V. regia*). This remarkable plant bears oval or orbicular leaves, often six feet in diameter. The flowers are very large, the sepals being brownish in colour, whilst the outer petals are white and spreading, and the inner petals are rose-coloured and filamentous. The flowers are followed by large, green, prickly, fleshy berries, containing numerous dark-coloured seeds. Cultivated as a stove plant in Britain, the royal water lily is best treated as an annual. Seeds should be sown in January in a pot of rich loam, partly sunk in water, the temperature never being allowed to fall below 85° F. In April or May the young plants may be transferred to the tank, the temperature being kept over 80° day and night. Plenty of sunlight should be given.



Victoria regia.

Victoria, a first-class British ironclad, launched in 1887, and, whilst temporary flagship in the Mediterranean, was, on June 22, 1893, inadvertently rammed by the *Camperdown*, off the coast of Syria, and sank within a few minutes, carrying down with her Vice-Admiral Sir George Tryon and 358 of the crew.

Victoria, a state of the Australian Commonwealth, lies in the S.E. of the continent, between 34° and 39° S. lat., and 141° and 150° E. long. It is separated on N. and N.E. from the state of New South Wales by the river Murray, and by an imaginary line running from Cape Howe to Forest Hill; on the W. lies South Australia, and on the S. and S.E. the Southern Ocean, Bass Strait, and the Pacific Ocean. Its area is 87,884 sq. m., or rather less than that of Great Britain. Pop. (1901) 1,201,341. The coast-line is broken by several bays and capes. The principal harbour is Port Phillip Bay (31 m. long and 20 m. wide at the middle); its headwaters are called Hobson's Bay, and form the port of Melbourne; its S.W. corner forms Corio Bay, at the head of which is situated Geelong. Victoria is traversed

from E. to W. by the Dividing Range, from 60 to 70 m. from the S. coast. The streams which rise on the N. side (e.g. the Goulburn) flow towards the Murray, and those on the S. to the sea. The temperature to the N. of this range is higher than to the S., and the rainfall less; highest temperature, 111° 2' F.; minimum, 27°; average yearly rainfall, 25·51 in. In no part of Victoria are there the scorching heat and the liability to droughts which exist in some portions of the Australian continent. The only drawback to the climate is the hot 'wind,' which blows on an average for eleven days in the year. The climate is extremely salubrious, and the mean death-rate is 14·29. The soil is generally good, and in many districts extremely rich, and all the corn, trees, fruits, and vegetables which are found in temperate Europe can be grown.

Victoria contains many salt and fresh water lakes and lagoons,

most of them merely swamps during dry seasons. Lake Corangamite, the largest inland lake, covers 90 sq. m., and is quite salt.

The eastern part of the Dividing Range is called the Australian Alps, and divides the Gippsland district from the Murray; the western part is termed the Grampians and Pyrenees. The higher peaks of the Dividing Range are covered with snow for several months in the year. The lower mountains are for the most part densely wooded. The highest mountain in Victoria is Bogong, 6,508 ft. above sea-level.

The trees indigenous to the state belong to the eucalyptus family, popularly known as the gum-tree. The red and blue gums are the most useful. Ferns are numerous, and the fern-trees grow to a large size. Wheat, oats, and barley are the principal crops; maize and rye are occasionally grown. Pease, beans, and potatoes, beets and sorghum, all thrive, and tobacco has been successfully introduced. Fibre plants such as ramie and New Zealand flax grow well. Fruits of all kinds give satisfactory results. Viticulture is carried on extensively, there being 28,000

acres of vineyards. Colonial raisins and currants and other dried fruits are supplanting the imported article. Large sums of money have been spent upon irrigation, and one settlement for 'intensive culture' has been established at Mildura on the Murray.

The original animals of Victoria, nearly all marsupials, were the kangaroo, wallaby, paddymelon, kangaroo rats, dingoes or native dogs, opossums, wombats, porcupines or ant-eating Echidna, bandicoots, native bears or sloths, native cats, and a species of stoat. The bat tribe also was well represented, the largest known being the flying-fox. Snakes are found

and frozen meat are exported. The total yield of the gold fields from 1851 to 1904 inclusive was 68,325,375 ounces, valued at £273,301,500; the present annual yield is about 800,000 ounces, valued at £3,200,000. Coal is found in several localities, and nearly 250,000 tons of good quality are raised annually. Other mining products are tin, quicksilver, and infusorial earth. Considerable quantities of copper, lead, antimony, lignite, and kaolin have also been raised at various times. The manufactures include flour mills, breweries, distilleries, woollen mills, brickyards, soap and candle works, tobacco and cigar factories,

frozen meat and rabbits, tallow, leather, live stock, cheese, bark, preserved meat, hay, chaff, and straw. The railways of Victoria belong to the state. There is a branch of the Royal Mint at Melbourne, but it coins only gold. Up to 1905 the total coinage amounted to £110,268,160.

The state is administered by a governor (appointed by the crown for six years), a cabinet of eleven ministers, a representative council of thirty-five members (since 1903), and a legislative assembly of sixty-eight members. Primary education is free, secular, and compulsory. Melbourne University is both a teaching and an examining institution. The average



in most localities, the bite of the black and brown snake and of the death-adder being generally fatal. Trout and perch have been introduced, although the rivers were always well supplied with cod and blackfish; and the coasts abound with snapper, flat-heads, trevally, cray fish, and the smaller shell fish.

The principal industries are mining and pastoral and agricultural pursuits, but a large section of the population is employed in manufacturing. The grazing of sheep and cattle is carried on on a grand scale. The principal crops grown are wheat, oats, potatoes, hay, and wine. Large quantities of wool, butter,

tanneries, fell-mongeries, saw-mills, and iron foundries. There are also bacon-curing, butter-making, clothing and tailoring, bootmaking, printing, chemical, wool-washing, agricultural implement, cabinet-making, and upholstery establishments.

The principal ports of Victoria are Melbourne and Geelong in Port Phillip Bay; Portland, Belfast, and Warrnambool in the Southern Ocean; Port Albert, near Corner Inlet; and Cunningham, at the entrance to the Gippsland Lakes. The imports for 1904 were valued at £20,091,951, and the exports at £24,404,907, the principal items being wool, butter, gold, grain, sheepskins,

annual number of graduates is 160, and women have the same corporate privileges as men. Three colleges—Anglican, Presbyterian, and Wesleyan—are affiliated to the university. A conservatorium of music is attached to the university.

Victoria was the first portion of Australia to be visited by Captain Cook, on April 19, 1770. In 1798 Dr. Bass sailed along its southern coast, and demonstrated that the strait which bears his name separated the mainland of Australia from Tasmania. In 1801 Lieutenant Murray discovered Port Phillip Bay. In 1803 Colonel David Collins formed a convict settlement on the shores of Port

Phillip, but it was abandoned three months afterwards. In 1850 Port Phillip was separated from New South Wales, and made a separate colony under the name of Victoria. Melbourne had been created a city in 1847. Gold was discovered in 1851, and from that date the colony advanced by leaps and bounds. In 1853 the University of Melbourne was founded. Victoria dispatched several contingents to South Africa to assist in the war against the Boers, and sent a naval contingent to serve with the British troops in China. The immigration of coloured races is restricted as much as possible. See M'Lean's *Victorian Year Book*, Brain's *The Colony of Victoria* (1897), Labillière's *Early History of the Colony of Victoria* (1878), and H. G. Turner's *History of the Colony of Victoria* (2 vols. 1904).

Victoria, city, cap. of British Columbia, on the S.E. extremity of Vancouver I.; was incorporated in 1852. Esquimalt, a naval station, and Oak Bay are suburbs. Victoria has rail connection with Ladysmith and Nanaimo, important coal-mining centres; also with Sydney, an agricultural centre. Railway forries connect with the Canadian Pacific and the Great Northern Railways. There are extensive sawmills, shipbuilding plants, iron-working plants, fish canneries, and chemical and other factories; and the city is a tourist resort. Its leading architectural features are the Parliament buildings, Government House, the Canadian Pacific Hotel, Post Office, and churches. Victoria has one of the best harbours on the Pacific coast, and is a port of call for the Transpacific steamship lines running to Vancouver, Seattle, and Tacoma. The climate is mild, and the rainfall small. There is a Canadian garrison in the city. Pop. (1901) 20,816.

Victoria, LAKE, SARY-KUL, or ZOR-KUL, on Pamir highland, in 37° 27' N. lat., 13,870 ft. above sea-level, 17 m. long and 3 m. broad, is traditionally considered as the principal source of the Oxus. Since 1885 it has marked a section of the Pamir frontier between Russia and Afghanistan.

Victoria (1819-1901), queen of Great Britain, ascended the throne in 1837, in succession to her uncle William IV. She was the daughter of the Duke of Kent, son of George III. Her reign falls into two divisions—(1) the period from 1837 to 1865, the death of Lord Palmerston; and (2) from 1865 to 1901. From 1837 to 1865 the middle classes, who had gained so much from the Reform Bill of 1832, were in power, and during the greater part of the period the Whigs were

in office. Lord Melbourne was prime minister at the time of the Queen's accession. Canada was in a state of revolt, and in 1838 Lord Durham was sent out to settle matters, and Upper and Lower Canada were united under a popular constitution. At home the discontent of the lower orders had resulted in the Chartist movement, and riots broke out in various parts of England and Wales. In 1839 Melbourne's ministry fell; but as the queen and Peel (the leader of the Tories) could not agree over the bedchamber custom, Melbourne returned to power. On Feb. 10, 1840, the Queen married her cousin Albert, youngest son of the Duke of Saxe-Coburg. The adoption of the penny postage, the establishment of an education department, and the passing of the Irish Municipal Bill were measures of importance.

Peel's ministry, which lasted from 1841 to 1846, saw a war with Afghanistan (1841-2), and the beginning of a long war with the Sikhs (1845-9), with the result that the Punjab was in 1849 annexed to British India. The Tractarian movement stirred up some excitement, which was increased when in 1845 Newman seceded to Rome. In Scotland some five hundred ministers in 1843 left the Established Church and founded the Free Church of Scotland. Peel imposed an income tax, renewed the Bank Charter Act, and in 1845 realized the importance of allowing foreign corn to enter the country free of duty. A famine in Ireland finally decided Peel to open the ports. The Anti-Corn Law League under Cobden and Bright supported him, and after resigning in December 1845, Peel returned to office in 1846, and carried the repeal of the Corn Laws. His Tory protectionist opponents then united with the Whigs and Radicals and overthrew the government. The Conservative party was broken up, and the Whigs were triumphant.

The friendly relations with Louis Philippe, which had continued for some years, were much valued by the queen, who resented the rough though successful methods which Palmerston adopted with regard to France. With the fall of Peel and the accession to office of Lord John Russell's ministry, the queen was again brought into close relations with Palmerston as foreign secretary. When revolutions burst out all over Europe in 1848, Palmerston sympathized with them, while the queen and Prince Albert naturally disliked any form of intervention on the part of England in favour of revolution. The

exhibition of 1851 was a sign of England's peaceful policy. In 1850 the queen and Prince Albert objected to Palmerston's habit of sending to European courts dispatches on foreign affairs before they had been subjected to the royal consideration. In December 1851 Palmerston resigned. In 1855 Palmerston, whose hold on the nation had vastly increased, became prime minister, and in 1856, by the treaty of Paris, brought the Crimean war to a successful conclusion. In 1857 he concluded a war with Persia, and entered upon a war with China over the question of the seizure of a British vessel. After the general election in 1857 he again became prime minister. During the Indian mutiny, which broke out in 1857, the conduct of the ministry was often criticised by the queen. In 1858, after Orsini's attempt to kill Napoleon III., Palmerston was defeated on the Conspiracy Bill. After the short ministry of Lord Derby, he again became prime minister in June 1859, and remained at the head of affairs till his death in 1865. The outbreak of civil war in America in 1861, and the Lancashire cotton famine which followed, were handled by the ministry on the whole with success, though the sailing of the *Alabama* from the Mersey proved later an expensive matter for Britain.

In December 1861 the Prince Consort died, and his death, coupled with that of Lord Palmerston in 1865, marked a new epoch in the queen's life. The latent Conservatism of the lower middle classes was appreciated by Disraeli, who in 1868 became prime minister. Two months later Gladstone carried a resolution in favour of the disestablishment of the Irish Church, and Disraeli's ministry fell. Gladstone's first ministry lasted from November 1868 till January 1874. It saw the Franco-German war; it disestablished the Irish Church; it brought forward an Irish Land Act and an elementary education act; it abolished religious tests at the universities of Oxford and Cambridge. Moreover, in 1871, Cardwell abolished purchase in the army; while, in 1872 and 1873, the Ballot Act and the Judicature Act were measures of undoubted usefulness. In all these measures the queen took a close interest. She disliked the disestablishment of the Irish Church, and she long hesitated before signing the royal warrant abolishing army purchase. In 1874 a strong Conservative majority was returned, and Disraeli again became prime minister, and remained in office till 1880. In 1876 the queen assumed the title of Empress of India, and Disraeli became Earl of Beacons-



Queen Victoria in her Coronation Robes. From the Picture by Sir George Hayter in the Royal Collection.

field. With singular foresight Disraeli had, in 1875, purchased about one-half of the shares of the Suez Canal. Lords Beaconsfield and Salisbury were supported by the nation when they went to the congress at Berlin in June 1878. Russia was forced to abate her demands, and the British ministers returned bringing 'peace with honour.' Britain was involved in a war with the Zulus, and it was not till July 1879 that the conquest of Zululand was effected. In that year Gladstone attacked the government in his Midlothian campaign, and in 1880 a large Liberal majority was returned. Gladstone at once formed a ministry, which remained in power till 1885. The British defeat at Majuba Hill on Feb. 26, 1881, was followed by a convention, giving the Boers self-government under British suzerainty. A rising in Egypt under Arabi Pasha necessitated immediate measures. As France refused to take any action, a British fleet bombarded Alexandria, and a British army won the battle of Tell-el-Kebir on Sept. 13, 1882, and restored the Khedive. Henceforward Britain was supreme in Egypt. In January 1885 General Gordon, who went to Khartum to withdraw all the Egyptian garrisons, was killed. The Irish Land League was formed in 1879, and an agitation for Home Rule begun. A land act was passed in 1881; but disorder increased, and in 1882 Lord Frederick Cavendish, the chief secretary for Ireland, and Mr. Burke, the under-secretary, were murdered in Phoenix Park, Dublin. A crimes act was at once passed, and for a time order was restored to Ireland. In 1884 a Franchise Bill became law, and in June 1885 Gladstone resigned. Lord Salisbury's administration only lasted till November 1885, when a general election took place, and Gladstone's third premiership began. A Home Rule Bill for Ireland was thrown out by the House of Lords; a split took place in the Liberal party, the opponents to Gladstone's bill being styled Liberal Unionists, and Lord Salisbury formed his second administration in July 1886, and continued in office till 1892. Steps were taken to preserve order in Ireland; county councils were created in 1888; and in 1891 free education was granted. In 1887 the queen celebrated her jubilee. In 1892 Gladstone again became prime minister; but having failed to carry his second Home Rule Bill, he retired in 1894, leaving Lord Rosebery at the head of the government. The latter failed to carry a bill for the disestablishment of the church in Wales, and

his ministry fell in June 1895. Lord Salisbury's third administration followed. The close of 1895 saw the Venezuelan dispute with America, and the Jameson Raid into the Transvaal, which ended disastrously in January 1896. The following year saw the beginning of the British advance in the Sudan, and the queen's diamond jubilee (1897). The attempt of France to hold Fashoda almost led to war in 1898. In 1899 war broke out between Great Britain and the Transvaal republic, which was aided by the Orange Free State. But in June 1902 the Boers were vanquished and peace made. In 1900 the Australian Commonwealth Bill was passed, and the same year the Boxer rising in China and massacres at Peking led to a joint invasion of China by Great Britain, Russia, France, and Japan. At the general election of 1900 the Conservatives were again in a majority, and Lord Salisbury continued in office.

Queen Victoria showed herself strictly impartial in the party politics of her reign, but she clearly recognized that the crown was the central tie which held together her vast empire. Her wisdom, her knowledge of foreign politics, her unselfishness and uprightness were all remarkable traits of her long reign. No sovereign has ever been so revered by her subjects as was Queen Victoria. See Lee's *Queen Victoria: a Biography* (1904).

Victoria and Albert, ORDER OF. See ORDERS OF KNIGHTHOOD.



The Victoria Cross.

Victoria Cross, a decoration conferred on officers and men of all ranks of the British army and navy for personal bravery. It was founded on Jan. 29, 1856, and consists of a bronze Maltese cross, bearing in the centre the royal crown, surmounted by a lion, while on a scroll underneath is the inscription, 'For Valour.' A special pension of £10 a year

is granted to every soldier who receives the Victoria Cross, with an additional £5 for each bar. In the event of an annuitant being unable to earn a livelihood, the amount may be increased to £50. The distinction has been gained by 522 officers and men, of whom 201 are now living (1906). See Toomey's *Heroes of the Victoria Cross* (1897).

Victoria Day, now widely known as EMPIRE DAY, is an imperial celebration held on the anniversary of the late Queen Victoria's birthday (May 24). The movement, inaugurated in 1902 by the Earl of Meath, has spread with great rapidity both at home and in the colonies, and has been officially recognized since 1902.

Victoria Falls. See ZAMEBEZI. **Victorian Order, THE ROYAL.** See ORDERS OF KNIGHTHOOD.

Victoria Nyanza, a lake in equatorial Africa, cut politically by 1° s., the part to the N. of this line being included in the British protectorate of Uganda, and the part to the S. of it in German E. Africa. The area is estimated at 26,000 sq. m. On the N.E. it projects into Kavirondo Bay. Farther w. the north coast describes successively Berkeley Bay, with Port Victoria, on its E. shore; Macdonald Bay; Napoleon Gulf, which at its entrance is blocked by the island of Buvuma. The only outlet of the lake is through this gulf, by the Victoria or Somerset Nile. Farther w. is Murchison Bay, hemmed in on the w. by a three-fingered projection, on which stands Entebbe or Port Alice. The N.W. corner of the lake is occupied by the Sesse Archipelago, including the large island of Bukasa. The southern end of the lake projects eastwards into Speke Gulf, and southwards into Emin Pasha Gulf. To the N. of the mouth of Speke Gulf lies the island of Ukerewe, 25 m. long by 12 broad. The greatest feeder of the lake is the Kagera on the w. The total catchment area of the lake is estimated at from 95,000 to 100,000 sq. m. The lake is connected by railway from Port Florence with Mombasa on the Indian Ocean. Discovered by Speke in 1858, the lake was circumnavigated by Stanley in 1875 and 1889, and by Baumann in 1892. A survey by Commander Whitehouse of the whole coast and islands of the lake was completed in 1906.

Victoria University, THE, Manchester, was founded in 1880. Its nucleus was Owens College, which dates from 1846, when John Owens left about £100,000 to found a college free from religious tests. Until 1903 the university was made up of Owens College, Manchester, University

College, Liverpool, and Yorkshire College, Leeds; but in that year the University College, Liverpool, became a separate university, and in 1904 a charter was granted for the establishment of a University of Leeds.

Victorious, a British first-class battleship (14,900 tons), launched in 1895.

Victory, a British 100-gun ship (2,164), launched in 1765; was Nelson's flagship at Trafalgar (1805), and now (1906) serves as flagship at Portsmouth.

Victualling. See **RATIONS**.



H.M.S. Victory going into Action at Trafalgar.

(Copyright by Symonds & Co., Portsmouth.)

Victualling Bill, a custom-house permit, authorizing the embarkation of bonded stores by the skipper of any outward-bound ship, as supplies for his voyage.

Victualling Yards. The victualling yards of the British navy are: At Home—Deptford, Gosport, Plymouth, Haulbowline (Queenstown). Mediterranean—Gibraltar, Malta. North America and West Indies—Halifax, Jamaica, Bermuda. Cape of Good Hope and West Coast—Cape of Good Hope. Pacific—Esquimaux

(Vancouver I.). China—Hongkong and Wei-hai-Wei. East Indies—Trincomalee, Australia—Sydney.

Vicuña, or **VICUNIA** (*Auchenia vicuña*), one of the two wild forms of the genus *Auchenia*, the other being the guanaco. It is smaller and more slightly built than the guanaco, is of a pale brown colour, and has no callosities on the hind legs. It is found in the Cordillera, in flocks of a male and from six to fifteen females. Vicuñas are hunted by the Indians for their wool.

and obtained the patronage of Alfonso II. of Aragon, Alfonso VIII. of Castile, Count of Marseilles, and Boniface de Montferrat. His lyrics were published by Bartsch (1857). See *Life* by Schopf (1887).

Vidin. See **WIDIN**.

Vidocq, **EUGÈNE FRANÇOIS** (1775–1857), French detective, born at Arras. After a series of escapades, which resulted in a sentence of eight years' imprisonment, he was lodged in the galleys, but made his escape. In 1809 he was employed by the secret police of Paris. In 1832 he opened a bureau in Paris for the recovery of stolen goods, which was suppressed by the police. It is doubtful if the *Mémoires* (4 vols. 1828) attributed to him are from his pen.



Vicuña.

Vieille, **PAUL MARIE EUGÈNE** (1854), French engineer, born in Paris; became sub-director of the government powder laboratory in Paris (1879) and professor of physics in L'Ecole Polytechnique (1885). In collaboration with Sarrau he worked on the subject of ballistics; he also invented (1885) smokeless powder.

Vieira, **ANTONIO** (1608–97), Portuguese missionary, born at Lisbon; became in Brazil a member of the Jesuit order (1625), and engaged in missions to the Indians. Finally (1681) he became director of the convents of the Jesuits. His works include *Historia do Futuro* (1718) and *Voz Sagrada, Política, Rhetórica, e Métrica* (1748).

Vienna (Ger. *Wien*), the capital of the Austrian empire, stands on the Danube, where the river leaves the Bavarian plateau and enters the Austro-Hungarian plain. It commands the March or Morava valley, which gives access to Germany, and it is the nearest point on the Danube to the head of the Adriatic, with which Vienna is connected at Trieste by a railway passing through the Semmering tunnel. Vienna may be regarded as the centre of five natural districts: The E. Alps, abounding in salt, timber, and iron; Bohemia, rich

Vida, **MARCO GIROLAMO** (1490–1566), modern Latin poet, born at Cremona; became a canon of St. John Lateran in Rome, and afterwards prior of St. Silvester, near Tivoli. Pope Clement VII. promoted him (1532) to be bishop of Alba. His chief poems are *Christias* (1535), *Seacchia Ludus* (1527), and *De Arte Poetica* (1527). See *Life* by Lancetti (1840).

Vidal, **PEIRE**, troubadour, who flourished at the end of the 12th century and the beginning of the 13th. He was born at Toulouse,



Views in Vienna.

1. Franzensring. (Photo by Photochrom Co.) 2. The Kursaal. 3. The Rathaus. 4. Museum. 5. St. Stephen's Cathedral. 6. Togthoff Monument and Praterstrasse. 7. University. 8. Opera House. 9. Schwarzenberg Palace.

in coal and silver; Moravia, fertile in itself; Upper Hungary, with its precious metals and copper; and the Hungarian plain (the *puszta*), a region of high agricultural and pastoral abundance, engirt with vine-clothed slopes. It is also a great manufacturing centre. Its specialities are iron and steel goods, silks, cheap furniture ('bent-wood'), ornamental leather and bronze work. The kernel of the city, the *Innere Stadt*, is encircled by the Ringstrasse, with its palaces, and by the Franz-Josefs Quay, on the Danube Canal, which is a branch of the Danube. Outside the kernel lie thirty-four suburbs, the total area being (after further enlargements in 1904) 72 sq. m., with a population of 1,727,000. In the *Innere Stadt* are the cathedral of St. Stephen (1300-1510)

in 14 A.D.). Mediæval Vienna was the capital of the Ostmark (Eastern March), was a gathering and halting point for Crusaders, and in 1276 became the capital of the possessions of the Hapsburgs. Vienna endured famous Turkish sieges in 1529 and 1683, the latter being raised by John Sobieski, king of Poland. The city has been often chosen as a meeting-place for treaty-making powers. Vienna was the birthplace of Maria Theresa, Marie Antoinette, Maximilian of Mexico; of the musicians, Johann Strauss, Schubert, Czerny; of Marshal Daun; of the painter Schwind; of Grillparzer, the dramatist; and of the traveller and diplomat, Baron Hübnér.

Vienne, dep. of W. France, between Indre on E. and Deux-Sevres on W.; covers an area of

at Madrid; went to Paris (1870), where he was employed as draughtsman on *Le Monde Illustré*, *La Vie Moderne*, and *L'Image*. He illustrated Hugo's *L'Année Terrible* (1874), *Les Travailleurs de la Mer* (1876), *L'Homme qui Rit* and *Quatrevingt-treize* (1877), *Les Misérables* and *Notre Dame de Paris* (1882); Michelet's *Histoire de France* (1876-8), and *Histoire de la Révolution* (1883-7); Quevedo's *Don Pablo de Segovia* (1882); Bergerat's *L'Espagne* (1891), *La Nonne Alfarez* (1894), and *Le Cabaret des Trois Vertus* (1895). He was a brilliant master of black-and-white. See Marthold's *Daniel Vierge* (1905).

Viersen, tn., Rhine Province, Prussia, 10 m. s.w. of Krefeld; has manufactures of velvet, silk, and plush goods, and damask. Pop. (1900) 24,761.

Vierzon, tn., dep. Cher, France, on the Cher, 20 m. by rail n.w. of Bourges; has manufactures of glass and porcelain. Pop. (1901) 11,569.

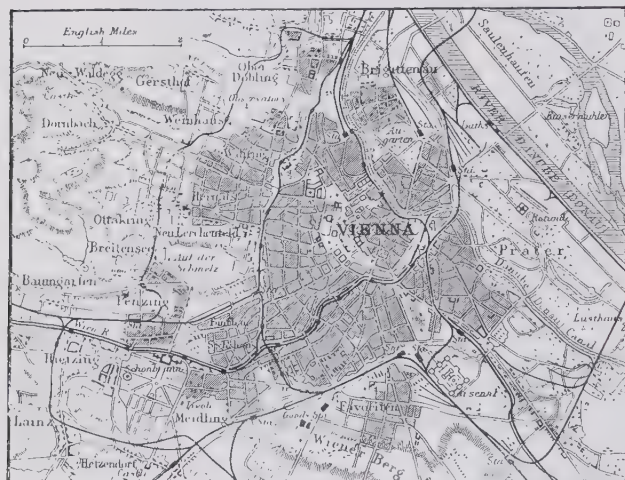
Vieta, FRANCISCUS, or FRANÇOIS VIETE (1540-1603), French mathematician, was born at Fontenay-le-Comte. He was a lawyer at Poitiers until 1567; then councillor of the parlement of Brittany and that of Tours (1589), and privy councillor to Henry IV. His *Opera Mathematica* were published at Leyden (1646).

Vieuxtemps, HENRI (1820-81), Belgian violinist and musical composer, born at Verviers. He was a great exponent of the modern brilliant school of violin-playing, and many of his compositions take a high place in classic violin music. See *Life* by Kufferath (1883).

Vigan, LE, invalid resort, dep. Gard, France, 29 m. n.w. of Montpellier; has silk-spinning and glove-making. Coal is mined and lithographic stone quarried. Pop. (1901) 5,030.

Vigevano, tn., Pavia prov., Lombardy, Italy, on the Ticino, 19 m. s.w. of Milan; has silk-spinning and manufactures of boots and furniture. Pop. (1901) 23,560.

Vígússon, GÚÐBRANDR (1828-89), Icelandic scholar, born in Breidafjörð; became stipendiary in the Armagnac library at Copenhagen. Settling in Oxford (1866), he was appointed Icelandic reader (1884). His writings opened a new era in the scholarship of his country; they include *Tímatöl* (1855); *Biskopa Sögur* (1856-78); *Bardar Saga* (1860); and *Fornsögur*, with Möbius (1860); *Eyrbyggja Saga* (1864); *Flateyjarbók*, with Unger (1860-8). He completed the *Icelandic-English Dictionary* (1859-74), commenced by Cleasby; while *Sturkunga Saga* appeared in 1878, and



Vienna and Environs.

and the Imperial Palace or Hofburg, with its wonderful relics, such as Charlemagne's coronation regalia, and Charles the Bold's famous diamond. On the Ringstrasse are situated many imposing public buildings—mostly modern, as nearly the whole of Vienna is—such as the Opera House (seating 3,000 people); the university (1874-84, though founded in 1365), which contains one of the world's famous medical schools; the Parliament House and Supreme Law Courts (in the former the imperial government sits alternately with Budapest); and the town hall. Vienna possesses many public parks, notably the Prater (7 sq. m.), and a magnificent picture gallery, supreme in its examples of the Venetian masters, and in those of Dürer and Rubens.

Here was the Roman frontier town of Vindobona (established

2,711 sq. m., and is watered by the Vienne. Wheat, oats, and vines are cultivated, and cutlery, arms, and paper are manufactured. The capital is Poitiers. Pop. (1901) 336,343.

Vienne (Lat. *Vienna*), tn., dep. Isère, France, on l. bk. of Rhone, 18 m. s. of Lyons; has manufactures of woollen caps and gloves, and lead and copper mining. There are schools of weaving and design. Its cathedral is Romanesque Gothic. It was the chief city of the Allobroges, later of the kingdom of Burgundy (450-534 and 879 onwards). Under the Roman empire it rivalled Lugdunum (Lyons) in importance. Several remains of the ancient city still survive. Pop. (1901) 22,768.

Vienne, HAUTE. See HAUTE-VIENNE.

Vierge, DANIEL URRABIETA (1848-1904), Spanish artist, born

Corpus Poeticum Boreale (with Powell) in 1883.

Vigil, the evening before certain holy days—e.g. the Nativity. St. Jerome defends the custom of all-night vigils (*Ep.* xxxvi.); but about the year 420 evening fasts were substituted as more conducive to public order. A night-long fast on All-hallows-day seems to have continued in England till 1545.

Vigil, FRANCISCO. DE PAULA GONZALEZ. See GONZALEZ VIGIL.

Vigilance Societies, self-constituted tribunals of citizens in the western states of N. America, formed to punish summarily horse-thieves, highway robbers, burglars, swindlers, murderers, and other criminals, after a rude form of trial; also, in some cases, for the suppression of vice and drunkenness. These societies have also been known as Vigilantes, Regulators, law and order men, and White Caps. See LYNCH LAW.

Vigilantius, a presbyter of the 4th century, a native of Gaul, who put himself in opposition against the excessive cult of saints, the use of relics, and the ultra-ascetic tendency of the monks. See Gilly's *Vigilantius and his Times* (1844).

Vigna, PIER DELLA, or PETRUS DE VINEA (c. 1190-1249), Italian statesman and jurist, was born at Capua. He rose to be a judge, then the confidant and chancellor of the Emperor Frederick II. He revised the laws of the two Sicilies, acted as legate to the papal and English courts, and defended Frederick before the Council of Lyons (1245). His enemies accused him of plotting against the emperor's life, and he was imprisoned and blinded at S. Miniato, where he died. He wrote a treatise, *De Potestate Imperiali*, and a number of Latin and Italian poems. His *Letters* (1566; later ed. by Iselin, 1740) are invaluable for the history of the time. See Huillard-Bréholles's *Vie et Correspondance de Pierre de la Vigne* (1864).

Vignette, a photograph or drawing in which the background is gradually shaded away to the margin. The word originally meant the Gothic ornament of vine leaves and grapes used in architecture; also the head and tail pieces employed by printers.

Vignola, whose real name was GIACOMO BAROZZI or BAROCCHI (1507-73), Italian architect, born at Vignola, near Modena; was papal architect (1550) and architect of St. Peter's, Rome (1564). He designed the church of St. Petronius at Bologna and some of the finest buildings in that city. He became architect to Pope Julius III., and built for him the Villa Giulia. He also designed

the palace of Cardinal Alexander Farnese at Caparola, near Viterbo. He wrote a long famous *Regole delle Cinque Ordini d'Architettura* (1563; new ed. 1815).

Vigny, ALFRED VICTOR, COMTE DE (1799-1863), French poet, born at Loches (Indre-et-Loire). In 1822 were published his *Poèmes*, followed (1824) by *Eloa* and (1826) *Poèmes Antiques et Modernes*. His novel of *Cinq Mars* (1826), which shows the influence of Sir Walter Scott, is the first historical romance of French literature. Then followed the drama *La Maréchale d'Ancre* (1831). *Stello* (1832) is a novel to the glorification of the luckless poets Chénier, Gilbert, and Chatterton. Next, in 1835, appeared *Servitude et Grandeur Militaires*. The same year he achieved his greatest triumph in his drama of *Chatterton*. In 1842 he was received into the Academy. In 1864 appeared *Les Destinées*, containing verse of rare beauty; and (1867) *Journal d'un Poète*, of uncommon range and delicacy of sensibility. His *Œuvres Complètes* appeared in 8 vols. (1883-85). See notices by M. Paléologue (1891), E. Montégut (1867), and Sainte-Beuve.

Vigo, city, prov. Pontevedra, Spain, naval station on Atlantic, and one of the best harbours in Spain; has considerable fishing and preserving industry. Pop. (1900) 23,259.

Vigo Bay, BATTLE OF. Here in 1702 the French Admiral Château-Renault was attacked and defeated by the English and Dutch under Sir G. Rooke and Admiral Van Almonde.

Vihara. See INDIAN ARCHITECTURE.

Vijayanagar, ruined city, Bellary dist., Madras Presidency, India; was from the 14th to the 16th century capital of a powerful Hindu kingdom. See *A Forgotten Empire* (Vijayanagar), by R. Sewell (1900).

Viking. See NORSEMEN.

Vikramaditya. See INDIA.

Vikramorvasi. See KÁLIDÁSA.

Vilayet, the name given to a Turkish province. A *sanjak* is a subdivision of a vilayet.

Vilkomir, or WILKOMIERZ, tn., Kovno gov., W. Russia, 40 m. N.E. of Kovno city. It has manufactures of pottery, hydromel, and mineral waters. Pop. (1897) 13,509.

Villa Concepcion. See CONCEPCION.

Villafranca, tn., Verona prov., Venetia, Italy, 10 m. S.W. of Verona; has manufactures of silk. Pop. (1901) 9,635. Here, in 1859, peace was concluded between France and Austria.

Village Community. Seebohm believes that in eastern England

the agricultural village community existed—and in western England the tribal system—in a pastoral stage, with a periodic redistribution of lands, which has no place in the village community so far as regards arable land. The questions naturally arise—Is the village community a primitive institution? Was it composed of freemen or of serfs? And if of freemen, when was the manorial system imposed on it? And, above all, what was the relation of the village community to the tribal system which existed side by side with it as in Britain? To these questions Vinogradoff returns answers which represent the safe middle ground. 'The communal organization of the peasantry he finds more ancient than the manorial order'—that is, it may have been an institution of free men, though probability points to a mixture of free and unfree elements. But it is hardly a primitive institution, because by its division of arable land into strips it shows traces of that periodical redistribution of the land which characterizes the tribal system. The village community is, therefore, what the tribal system became when agriculture was introduced. Hence the village communities were the tribe divided into agricultural groups, with an overlord, generally at a distance, to whom tribute was paid. At first the relation between the village and the overlord was remote, but the feudal system introduced intermediate lords, who looked not so much for tribute as for the cultivation of the land; and thus the distant lord was replaced by a neighbouring lord of the manor, and the freedom of the village community was changed to the practical servitudes of the manor. This change may have come with the advent of the Romans, but feudalism made the pressure closer. See Seebohm's *English Village Communities* (1884), Gomme's *Village Community* (1890), Baden-Powell's *The Indian Village Community* (1895).

Villani, GIOVANNI (c. 1275-1348), Florentine historian, was prior of Florence in 1316, 1321, and 1328. His chronicle becomes of the utmost value as it approaches the author's own period. Scarcely less important is the continuation of the work by his brother Matteo, who brought it down to 1363. Finally Matteo's son Filippo not only completed his father's eleventh book, but himself undertook a useful *Liber de civitatis Florentinae famosis civibus* (ed. by Galletti, 1847). The earliest edition of the entire chronicle (1537) was followed by those of Magheri (1823-6; with Mazzuchelli's *Vite*), Gherardi-Drago-

manni (1844), and Racheli (1857-83). See, too, Selfe and Wicksteed's *Selections from the first nine Books of the Cronache Fiorentine* (1896).

Villanueva de la Serena, city, prov. Badajoz, Spain, 63 m. E. of Badajoz. Pop. (1900) 13,489.

Villanueva y Geltru, tn., prov. Barcelona, Spain, on Mediterranean, 25 m. S.W. of Barcelona; centre of production of 'Manchester goods.' Strong red wine is also produced. Pop. (1900) 11,856.

Villari, PASQUALE (1827), Italian historian and statesman, was born at Naples. Exiled for political reasons in 1847, he sought refuge at Florence, where (save for three years as professor of modern history at Pisa, 1859-62) he has been ever since. In 1862 he was appointed to the chair of history at the Florentine *Istituto di Studi superiori*. At various times he was deputy, senator, and minister of instruction (1891). He is president of the Accademia de' Lincei. His books on *Savonarola* (1859-61; Eng. trans. by his wife, Linda Villari, an Englishwoman, 1888), *Machiavelli* (1877-82; Eng. trans. 1878), the *Barbarian Invasions of Italy* (Eng. trans. 1902), and *The Two First Centuries of Florentine History* (1893-4; Eng. trans. 1894-5) have revolutionized history-writing in Italy. His *Scritti sulla questione sociale in Italia* appeared in 1902.

Villa Rica, tn., Paraguay, S. America, 81 m. E.S.E. of Asunción. It is a chief centre for the cultivation and manufacture of tobacco. Coffee and fruits are also grown. Pop. 11,000.

Villars, CLAUDE LOUIS HECTOR, DUC DE (1653-1734), marshal of France, was born at Moulins. A cavalry officer under Turenne, Condé, and Luxembourg, he commanded (1692) in the action of Pforzheim. During the peace of 1698-1701, Villars was entrusted with a secret diplomatic mission at Vienna; for he shone in society and cabinet as he did on the field. Appointed to the chief command in 1702, he led an army to the support of the elector of Bavaria, and winning the battle of Friedlingen, was made marshal of France. Joining the elector of Bavaria in 1703, his design of marching on Vienna was frustrated by that prince's indolence. In spite, therefore, of his victory of Höchstädt, he sought his recall. Dispatched to the Cevennes (1704), he humanely concluded a peace with the insurgent Camisards. In 1709 he was defeated by Marlborough at Malplaquet. Commander-in-chief in the Netherlands, he gained a victory at Denain in 1712, and brought about the peace of Rastatt

(1714). Villars, in 1733, drove the imperialists from Milan and Mantua. He died at Turin. His *Mémoires* were published by De Vogüé (1884-7). See also *Lives* by De Vogüé (1888) and Giraud (1881).

Villarsia, a genus of Australian and South African herbaceous marsh plants, belonging to the order Gentianaceæ. They bear white or yellow flowers arranged in cymes.

Villegas, ESTEBAN MANUEL (1596-1669), Spanish poet, born at Najera in Castile. As a boy he produced a series of Anacreontic erotic verses, which have had no equal in the language, and upon their publication, under the title of *Las Eroticas* (1617-18), took the town by storm. In 1620 an enlarged collection called *Amatorias* was issued.

Villehardouin, GEOFFROI DE (c. 1160-c. 1213), French historian, was born at the castle of Villehardouin in Aube. Marshal of Champagne (1191), he went in 1201 to negotiate with the Venetians about the transport of the crusaders to the Holy Land. He took part in the expedition ending in the storming of Constantinople and the fall of the Greek empire. He rescued the crusading army at Adrianople from complete destruction by the Bulgarians. His *Conquête de Constantinople* is of great value, and narrates the events of the fourth crusade, from 1197 to 1207. See the edition by De Wailly (1882), and Sainte-Beuve's *Causeries du Lundi*, ix.

Villein, in feudal times, one who tenanted land by *villein*—i.e. by performing base or menial service to his superior. See SLAVERY.

Villemain, ABEL FRANÇOIS (1790-1867), French author and politician, was born in Paris, and when barely twenty was appointed to the chair of rhetoric in the lyceum of Charlemagne. After the second restoration he became professor of eloquence to the faculty of letters. About the same time he entered the ministry as chief of the department of printing and publishing, and was afterwards named *ministre des requêtes* to the Council of State. He became a member of the Chamber of Deputies (1830); was made a peer of France and vice-president of the Royal Council of Public Instruction (1832), and minister of public instruction (1839-44). His chief works were *Histoire de Cromwell* (1819); *Lascaris, ou les Grecs du XV. Siècle* (1825); *Cours de Littérature Française* (1828-30); and *Histoire de Grégoire VII.* (1873).

Villemarque. See LA VILLEMARQUE.

Villena, tn., Alicante prov., Spain, 28 m. N.W. of Alicante; has manufactures of soap, brandy, silk, and salt. Pop. (1900) 14,099.

Villena, ENRIQUE DE (1384-1434), Aragonese writer, looked upon by his contemporaries as a prodigy of learning. He wrote an art of poetry (*Arte de Trovar*), and was a principal promoter of the affected poetical contests then in favour with the Spanish courts. He translated the *Æneid*, and much of Dante; and there survives a curious work of his on the art of carving and serving food, and a dissertation on the evil eye. The church burnt most of his books after his death. See Cotarello y Mori's *Don Enrique de Villena* (1896).

Villeneuve, PIERRE CHARLES JEAN BAPTISTE SYLVESTRE DE (1763-1806), admiral of France, was born at Valensoles (Basse-Alpes). He was in command of the rear division of the French fleet at the battle of the Nile. He was then appointed to command the Toulon fleet, and engaged Sir Robert Calder off the Azores. Blockaded in the harbour of Cadiz by Nelson, he ventured out, and lost all at the battle of Trafalgar (1805).

Villeneuve-sur-Loire, tn., dep. Lot-et-Garonne, France, 15 m. N.N.E. of Agen; has manufactures of paper and linen. Pop. (1901) 12,885.

Villeroi, FRANÇOIS DE NEUVILLE, DUC DE (1644-1730), was brought up at the court of Louis XIV. He was made a marshal in 1680, but showed incapacity both in the Netherlands and in Italy, where Prince Eugene took him prisoner at Cremona. Marlborough defeated him at Ramillies (1706). Through Madame de Maintenon's influence he was made guardian of Louis XV.

Villiers. See BUCKINGHAM, DUKE OF, and CLARENDON, EARL OF.

Villiers, BARBARA. See CASTLEMAINE, COUNTESS OF.

Villiers, CHARLES PELHAM (1802-98), English statesman and reformer, born in London, and called to the bar at Lincoln's Inn (1827). He was returned M.P. for Wolverhampton (1835), and retained that seat until his death. He was president of the Poor Law Board, with cabinet rank (1859-66).

Villiers, FREDERIC (1852), English war correspondent and artist, was born in London, and is widely known as the war artist for the *Graphic*. He was in Serbia (1876); with the Russian army in Turkey (1877); in Afghanistan (1878); at Tell-el-Kebir (1882); in the 'broken square' at Tamaï (1882); with the Nile expedition (1884), and at the battles of Abu-

Klea and Gubat (1885). He was attached to the Australian contingent during the S. African war (1899-1902), and was at Port Arthur during the Russo-Japanese war (1904-5).

Villiers de l'Isle-Adam, PHILIPPE AUGUSTE MATHIAS, COUNT (1840-89), French poet, was born at Saint-Brieuc in Brittany. He wrote a large number of dramas and poems, among them *Isis* (1862); *La Révolte* (1870); *Le Nouveau Monde* (1883); *Une Évasion* (1887); *Axel*; *Elen* (1862); and *Morgane* (1862); *Contes Cruels* (1883); *Tribulat Bonhomiet* (1887); *Acétyl-séril* (1888); and two philosophical romances, *L'Amour Suprême* and *L'Ève Future* (1886). See *Life*, in French, by Pontavise de Heussy (Eng. trans. 1894).

Villon, FRANÇOIS (1431-c. 1485), French poet, whose original name was Corbueil or De Montcorbier, was born in Paris. In 1455 he was banished for killing a priest in a street brawl, but in 1456 received a pardon, and on his return to Paris wrote his celebrated poem *Le Petit Testament*. In 1457, for some offence, he was sentenced to death, after submitting to the 'ordeal by water'; but having obtained a respite, he was again banished. In 1461 he turned up in prison at Meung-sur-Loire. This time he owed his escape to a jail delivery on the accession of Louis XI., when he wrote his greatest work, *Le Grand Testament*. Rabelais brings him to the court of Edward IV., and makes him, in his old age, retire to St. Maixent in Poitou. His poetry marked an era in the literature of Europe, displaying a strong capacity of feeling and expression, and a singularly mournful tone. Among his other poems are the *Ballade des Dames du Temps Jadis* and *Le Jargon*. *Les Repues Franches*, exquisitely translated by D. G. Rossetti, is wrongly attributed to Villon. The first dated edition of his poems is of 1489; good modern editions by Bibliophile Jacob (1854) and W. von Wurzbach (1903); and English translations have been made by Payne (1878), Swinburne, Lang, and Henley. Villon figures in the play *The Ballad-monger*, and in J. H. McCarthy's *If I were King*. See *Profilet's De la Vie et des Œuvres de Villon* (1856); *Campaux's Villon, sa Vie et ses Œuvres* (1859); *Longnon's Etude Biographique sur François Villon* (1877); and *Bijvanck's Spécimen d'un Essai Critique sur les Œuvres de François Villon* (1882).

Vilna. (1.) Government, W. Russia. Area 16,421 sq. m. Pop. (1897) 1,591,912. The surface is mostly a sandy plain; the highest point, w. of Vilna city, reaches 1,020 ft. The government belongs

to the Niemen and W. Dwina basins. Lakes and marshes are numerous. Black earth is found in the w., n.w., and n.e. Orchards and nurseries flourish. Domestic industries are mainly concerned with timber. The greater industrial establishments include flour, saw, and paper mills, distilleries, breweries, tanneries, glass and brick works. Of the population over one-half are Roman Catholics (Lithuanians and Poles), and nearly one-fourth Orthodox (White and Great Russians). (2.) Or VILNO, tn., W. Russia, cap. of Vilna gov., and of the old Lithuanian grand duchy, 190 m. E. of Königsberg in Prussia, is the seat of an Orthodox archbishop and of a Roman Catholic bishop, with cathedrals of St. Nicholas and St. Stanislas—the former built 1596-1604, the latter originally a foundation of 1387 (as the metropolitan church of all Lithuania), but rebuilt in 1801; churches of St. John (1388), of St. Anne (c. 1390), of St. Mary (14th century), of the Holy Spirit (1441), of SS. Bernard and Francis (1469), of St. Theresa (1626); convents of the Trinity (c. 1490), of the Holy Spirit (1592); a gate of the 16th century, with famous image of the Virgin; governor's palace, formerly the residence of Roman Catholic archbishops (16th to 18th century); buildings of university, founded by Stephen Bathori in 1578, suppressed 1832, but still containing two high schools. Vilna is a river port, and manufactures buttons, gloves, tobacco, confectionery, pencils, boots and shoes, brushes, hats, and artificial flowers. Pop. (1897) 162,633.

Vimeiro, or VIMEIRA, vil., Estremadura prov., Portugal, 31 m. n.w. of Lisbon; was the scene of Wellington's victory over the French under Junot, Aug. 21, 1808. Pop. (1900) 695.

Vinca, a genus of herbaceous and shrubby plants, belonging to the order Apocynaceæ. They generally bear large, salver-shaped, axillary, solitary flowers, often of much beauty. The hardy periwinkles, grown as trailing plants in Britain, belong to this genus. The Madagascar periwinkle, or old maid (*V. rosea*), is a tropical plant, requiring stove or greenhouse treatment.

Vincennes. (1.) Fortified tn., dep. Seine, France, 2 m. E. of the fortifications of Paris, on the N. border of the Bois de Vincennes; has manufactures of chemicals and cartridges. The keep of its castle was the prison of Henry IV., Condé, Diderot, Mirabeau, and others. Pop. (1901) 26,637. (2.) City, Indiana, U.S.A., co. seat of Knox co., on Wabash R., 60 m. s. of Terre Haute. Pop. (1900) 10,249.

Vincent, SAINT (d. 304), born at Saragossa; became involved in the persecution of Diocletian (303). According to tradition, his heroism under his sufferings converted his jailer to Christianity. His day is January 22. He died at Valencia.

Vincent, SIR CHARLES EDWARD HOWARD (1849), was born at Slinfold in Sussex. During the Boer war he took an active part in raising and organizing the C.I.V. contingent. In 1878 he became director of the Criminal Investigation Department, metropolitan police, till 1884. He was elected M.P. for Central Sheffield (Conservative) in 1885. He has written *Russia's Advance Eastward* (1874); *Police Code and Manual of Criminal Law* (1882; 12th ed. 1903); *Military Geography, Reconnoitring, and Sketching* (1873); and works on the *Law of Criticism and Libel* (1876), and *Law of Extradition* (1881).

Vincent, WILLIAM (1739-1815), dean of Westminster, born in London. He was appointed rector of All Hallows in 1779, and became headmaster of Westminster (1801) and dean (1802). He was one of the best scholars in Europe, his chief works being *Defence of Public Education* (1801), *De Legione Mantiana Quæstio* (1793), and *The Commerce and Navigation of the Ancients* (1807). See *Life* by Nares (1817).

Vincent de Beauvais (d. c. 1260), whose Latin name was Vincentius Bellocacensis, French Dominican monk, was tutor to the sons of Louis IX. He was the author of a huge Latin encyclopædia, entitled *Speculum Majus* (1473), and wrote religious works printed at Basel (1481). See Bourgeat's *Vincent de Beauvais* (1856).

Vincent de Paul, ST. (1576-1660), founder of the Sisters of Charity, was born near Dax in the French Landes. After many adventures he settled in Paris (1609), where Margaret of Valois employed him as her almoner. It was as curé of Châtillon that he established his first Confrérie de Charité for the relief of the sick and poor. He next turned his attention to the galleys, and succeeded in ameliorating the conditions of the unhappy convicts. In 1619 François de Sales gave him direction of the first convent of the Visitation. At Chartres, Vincent organized the Congregation of the Missions, an association of mission priests. In 1632 the Society of the Lazarists arose under his care. In 1634 he created the Filles de la Charité, the first association of uncloistered women living by rule, and devoted to the care of the sick and poor. A

branch of this community, the Dames de la Croix, was for the special service of the Hôtel Dieu at Paris. Vincent was the means of establishing the Foundling Hospital (1640) in that same city. He was beatified in 1729, and canonized a saint in 1737. His festival is on July 19. See *Life* in French by Chantelauze (1832) and Bougaud (1889; Eng. trans. 1900), and in English by R. F. Wilson (1873), and James Adderley's *Monsieur Vincent* (1901).

Vinci. See LEONARDO DA VINCI.

Vindelicia, the ancient name of the most western of the four Danubian provinces of the Roman empire. It included N.E. Switzerland, the s. of Württemberg and Bavaria, and the N. of Tyrol. Its inhabitants, the Vindelici, were of Celtic race. They were subdued by Tiberius in 15 B.C. Its chief town was Augusta Vindelicorum, the modern Augsburg.

Vindex, GAIVS JULIVS, a noble Gaul, who, when proprator of Celtic Gaul in 68 A.D., urged his people to rebel against Nero, and allied himself with Galba. Most of the Roman governors in Europe declared for Galba; but Verginius Rufus, governor of Upper Germany, marched against Vindex, and besieged Vesontio. Vindex committed suicide.

Vindhya, a series of mountain ranges forming the N. scarp of the Deccan in India. Altitude, 1,500 to 4,500 ft.

Vine (*Vitis vinifera*). The plant has been cultivated for many thousand years, as we know from Israelite and Egyptian records. The plant seems to have been introduced into England in the second or third century after Christ. Every abbey or monastery in the southern half of the country seems to have had its vineyard in the middle ages. Of the varieties of the grape-vine cultivated under glass in Britain the following list includes the best:—Black Hamburg, Madresfield Court, Muscat, Buckland sweetwater, Muscat of Alexandria, Canon Hall Muscat, black Alicante, gros Colmar, Mrs. Pearson, diamond jubilee, gros Maroc, gros Guillaume, Mrs. Pince's Black Muscat, and Lady Downe's. Vines make a more short-jointed, if less rapid, growth in a greenhouse, on account of the constant circulation of fresh air, than they do in a vinery proper. Assuming that the roots are planted outside, and the vines are taken into the house through an opening in the brickwork immediately under the wall-plate, liberal and frequent supplies of water should be given at the roots (in the absence of rain) as the vines advance in growth. Even without a glass house it is possible

to grow grapes, in the milder parts of Britain, against walls or fences facing south, west, or south-west. See Ward's *Book of the Grape* (1901).



Vine.
1, Fruit; 2, young flower; 3, section of flower.

Vinegar, the weak solution of acetic acid that is obtained by the oxidation of a dilute alcoholic liquor by the aid of the micro-organism *Mycoderma aceti*, or 'mother of vinegar'. The percentage of alcohol must not rise above ten. The liquors most often fermented are either a special kind of beer, from which 'malt' vinegar is obtained, or an inferior wine, from which 'white vinegar' or 'wine vinegar' is prepared, though cider is also employed to a small extent. In the 'slow vinegar process' the liquor is exposed in casks to the air, which is admitted through perforations. The process is assisted by periodical additions and removals of liquor, and lasts about six months. In the 'quick' process the solution, generally a malt liquor or diluted spirit containing bran or rye extract, is made to trickle through vats containing shavings, which are covered with *Mycoderma*.

All genuine varieties of vinegar contain esters, extractive and mineral matters, besides acetic acid, which should be present to the extent of from 5 to 7 per cent., the amount being usually expressed as the number of grains of sodium carbonate one fluid ounce will neutralize. White vinegar made from wine is pale yellow to red in colour. Potassium bitartrate is present; but it is absent from malt vinegar, which

is of a brown colour and characteristic refreshing odour. Both varieties are imitated, white wine vinegar by distilled malt vinegar, and -both by diluted acetic acid from the distillation of wood. See Brann's *Treatise on the Manufacture of Vinegar* (1902).

Vinegar Eel (*Anguillula aceti*), a small nematode commonly found in weak vinegar. See NEMATODES.

Vinegar Hill (alt. 389 ft.), in Co. Wexford, Ireland, 14 m. N. of Wexford; was the scene of the defeat of the Irish rebels by General Lake, June 21, 1798.

Vinegar Plant, a name given to various fungi, to whose activity is due the conversion of alcohol into vinegar, especially to the fungus *Mycoderma aceti*. This bacterium consists of rod-like cells, which are so joined as to form long filaments; these are embedded in a gelatinous substance so as to form a mass which floats on the surface of the fluid. Having finished its work, the vinegar plant falls a victim to various blue and green moulds which form on its surface.

Vinet, ALEXANDRE RODOLPHE (1797-1847), Swiss theologian and critic, was born at Ouchy, canton of Vaud. He was professor of French at Basel in 1817. In 1837 he became professor of theology at Lausanne. He joined the Free Church of Vaud, resigning his professorship in 1845. As a critic of French literature Vinet held a high place. His best books are *Christian Philosophy* (1846), *Vital Christianity* (1846), *Gospel Studies* (1851), *Pastoral Theology* (1852), *Studies in Pascal* (1859), *Outlines of Philosophy and Literature* (1865)—all translated into English. His *Lettres* were published by Secretan and Rambert (1882), and by De Pressensé (1890). See *Lives*, in French, by Chavannes (1883) and Molines (1890); in English, by Laura M. Lane (1890).

Vingt-et-Un. See GAMBLING.

Vinh, tn., cap. of prov. Vinh, French Indo-China, 10 m. from the sea, midway between Hanoi and Hué. Pop. 16,000. The province has a population of 1,200,000.

Vinje, AASMUND OLAFSSON (c. 1818-70), Norwegian author, born at Vinje in Upper Telemark. An acquaintance with Ivan Aasen induced him to adopt the *Maal* as his literary language, and in 1858 he began the publication of a weekly review in that dialect entitled *Dölen*, which speedily made him famous. In 1862 he received a stipend from the state to enable him to study the working of the jury systems in England and Scotland, the fruits whereof appeared as *A Norseman's Views of Britain and the British* (1863). In 1865 he

received a clerkship in the Norwegian Department of Justice, but he 'wrote himself out of this post' by articles in *Dølen* in 1868. His most important book was *Storegut* (1866), a narrative poem. A selection of his works (*Skifter i Uval*) was published in 5 vols. (1883-90). He was a successful translator of Byron. See V. Vislie's *Aasmund Vinje* (1890).

Vinnitsa, tn., Podolia gov., S.W. Russia, 92 m. E.N.E. of Kamenets, on the S. Bug; with manufactures of tobacco, soap, candles, carts and carriages. Pop. (1897) 28,995.



Violet.

1, Spurred pistil; 2, stamens and pistil.

Vint, a game at cards, resembling bridge, and much played by Russians. 'The value of the various suits, except for scoring purposes, is the same [as in bridge]; the manner of the play, after the declaration of trumps, is as in bridge, and it is a game for four players; but there is no dummy, and the making of the declaration is, as it were, put up to auction' (Oswald Crawford). But the scoring for honours and other chances of the game is relatively high as compared with the scoring for skill in play.

Viol, the generic name given to the immediate precursors of the violin, viola, violoncello, and double-bass. The viol differed from the first three in having a flat back, slanting shoulders, sound-holes of another form, and a greater number of strings. The double-bass has the flat back and contour of the viol, but sound-holes like those in the violin.

Viola, or TENOR VIOLIN. See VIOLIN.

Viola, a genus of perennial herbaceous plants belonging to the order Violaceæ. Most of the species are dwarf plants. The sweet violet is *V. odorata*; the

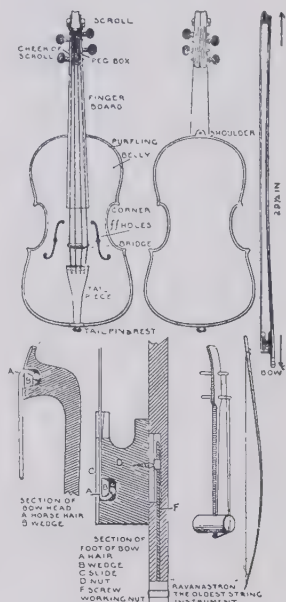
dog violet, *V. canina*; the heart-ease or pansy, *V. tricolor*. The garden hybrids known as violas or tufted pansies are among the most beautiful of plants.

Violaceæ, a natural order of herbs and shrubs, widely distributed over temperate and tropical regions. There are twenty-one genera, including *Viola* and *Hymenanthera*.

Violet, the popular name given to *Viola odorata*. There are white, blue, and purple varieties, and of these there are double sub-varieties. About the end of April the stock plants should be divided into single crowns, and these should be planted at nine-inch intervals in rows twelve inches apart. Those intended for frame culture are placed in the frames about the end of September, the frames being so made as to bring the plants near the glass.

Violin. Gasparo Bertolotti—better known as Gaspar di Salò—(d. 1610) of Brescia, Lombardy, seems to have been the first maker of violins. The violin has a hollow, resonant, oblong body, narrower in its upper portion, consisting of a back and a breast—both of which are convex—attached to and slightly overlapping narrow sides or ribs. The upper and lower extremities are rounded, and on each side of the instrument, a little above its centre, there are two inward curves, formed somewhat like the letter C. The narrow portion between the curves is termed the waist. On the breast in the lower portion of, and extending a little below, the waist, there are two longitudinal incisions, one on each side, formed like the letter f, and called f or sound holes. Their dimensions, degree of inclination towards each other, and distance from the sides and from the upper and lower extremities, have each and all considerable influence upon the tone of the instrument. Attached to the centre of the upper part of the violin is a neck, the prolongation of which is a head, usually terminating in the form of a scroll. An ebony finger-board and nut—a narrow ridge containing four tiny grooves placed at the upper end of the finger-board—are glued to the flat surface of the neck. The head contains four tuning pegs, two on each side, to which the upper ends of the strings are secured, the lower ends being fastened in a tail-piece attached to the bottom of the instrument. In the inside of the violin there are four small blocks, which fill up the respective corners. A larger block placed at the centre of the lower end contains the tail-pin. A similar block is placed at the centre of the upper end, and to this the neck is attached. The

back at this part contains a little semicircular projection, termed the button. The lower end of the neck is let into the block, so that the under horizontal surface of the neck rests against this button and against a portion of the back; by this means the neck is firmly united to the body of the instrument. The sides are bent to shape, and are only about $\frac{1}{4}$ in. thick. To strengthen these, and also to provide a broader surface for the attachment of the back and breast, the parts between the blocks have their edges thickened by means of tiny strips of wood called linings, which are bent to fit the inner curves of the sides,



Structure of Violin.

and are glued to them. The blocks and linings are usually made of pine, but willow, lime, and cedar are also used for these parts. The bass-bar is a little beam of pine, glued longitudinally but somewhat obliquely to the inner surface of the breast, and in such a position that the left—or G string—foot of the bridge is over the centre of the bar. The proportions and adjustment of the bass-bar require the nicest calculation in order to secure the best tonal results. The sound-post is a small movable pillar of pine, usually about $\frac{1}{4}$ in. in diameter, which stands upright between the back and the breast. It is usually from $\frac{1}{4}$ in. to $\frac{1}{2}$ in. behind the right foot of the bridge—i.e.

nearer the lower end of the instrument. If a violin is too high in build, the tone lacks volume; if too low, it lacks sympathetic quality; and in both cases the balance of tone between the upper and lower registers is unequal. Many of the best violins of Stradivari and Joseph Guarneri have a total depth of about 2½ in., the height of arch in back and breast being about half the height of the sides. The breast is always made of pine, and may be of one thickness all over, but is frequently thickest at the centre. The back, sides, neck, and head are almost invariably made of maple or sycamore; but these parts have also been made of beech and of birch. If the back and breast are too thin, the tone of the violin lacks solidity, and is easily played out; if too thick, the tone is thin and shrill, besides being difficult of production. The strings are raised above the lower end of the fingerboard, and have their vibrations communicated to the instrument by means of the bridge, which is movable and cut from a single piece of maple. It received its present form from Stradivari, and its artistic design is necessary to its properly fulfilling its functions. Too high a bridge makes the tone dull and slow of response, while if too low the tone becomes hard and piercing. The exterior of the violin is coated with varnish, which not only enhances the beauty of the instrument, but greatly affects its tone. Oil varnish gives better results than spirit varnish. Cremona violins are famous for the quality of their varnish, but after 1760 its secret seems to have been lost. An ordinary full-size violin is 14 in. in length of body, exclusive of the neck and head. The length of string from nut to bridge should not be more than 13 in.; great players seldom use a string longer than 12½ in.

The violin is strung with four strings tuned in fifths. The highest, or first, is tuned to the note E on the highest space of the treble stave; the second, third, and fourth strings are tuned respectively to the notes A, D, G below. The strings are made of gut, but firsts of silk are also used. The fourth string is covered with spun wire, pure silver being most in favour. In order to produce the desired intervals of pitch, the strings are stopped as required by the finger tips of the left hand. By the use of a small wood or ivory instrument, the 'mute,' a peculiarly soft tone, of muffled and tremulous quality, is obtained. Music for the violin is always written in the treble clef, and the compass of the instrument is

about four octaves, but this can be extended by the use of harmonics.

The viola or tenor violin is having its strings set in vibration by a band of rosined horse-hair, which forms part of a bow.

The viola or tenor violin is about a seventh larger than the violin, and is held and played in the same manner. Its four strings are tuned in fifths, one fifth lower than the violin, its notes, numbering from the highest string, being A, D, G, C. The two lower strings are covered with spun wire, and music for the instrument is written in the alto clef. The violoncello, or 'cello, is about twice the size of the violin, but its sides are deeper in proportion. Its four strings are tuned to the same notes as those of the viola, but are one octave lower, and its two lower strings are also covered with spun wire. Music for the 'cello is written in the bass clef, the tenor and treble clefs being also used for passages in the higher positions of the instrument. The double-bass is about twice the size of the 'cello, but has a flat back and sloping shoulders. It may be strung with three or with four strings, and in either case it may be tuned in various ways. A frequent method of tuning with four strings is G for the first or highest string, and D, A, E for the second, third, and fourth strings. Stringed instruments by the great Italian makers are considered superior to all others. Several instruments by Antonius Stradivari have each brought £2,000, while £1,850 has been given for a violin by Joseph Guarneri (I.H.S.). Among other distinguished Italian makers are Amati, Bergonzi, Gagliano, Gran-cino, Guadagnini, Maggini, Montagnana, Ruggierius, and Gasparo di Salo. Cellos by eminent makers command as high prices as violins. See Hart's *The Violin* (4th ed. 1887); H. Allen's *Violin-making as it was and is* (1884); W. H. Mayson's *Violin-making* (1895); H. Saint-George's *The Bow: its History, Manufacture, and Use* (1897); Haweis's *Old Violins* (1898); W. M. Morris's *British Violin-makers* (1904); and Ragster's *Chats on Violins* (1905).

Viollet-le-Duc, EUGÈNE EMANUEL (1814-79), French architect, born in Paris; was engaged upon the restoration of the Sainte-Chapelle in Paris (1840), Notre Dame (1845), and the abbey of St. Denis (1846). He wrote many able works, among them *Dictionnaire de l'Architecture Française du XI. XVI. Siècle* (1853-69) and *Chapelles de Notre Dame de Paris* (1869). A number of his works have been translated into English.

See *Lives*, in French, by Sauva-geot (1889) and Saint-Paul (1881).

Violoncello, or 'CELLO. See VIOLIN.



Viper.

Vionville, vil., Lorraine, Germany, 12 m. w. of Metz; was the scene of a desperate encounter—known also as Mars-la-Tour—(Aug. 16, 1870) between the Germans under Prince Frederick Charles and the French under Marshal Bazaine.

Viotti, GIOVANNI BATTISTA (1753-1824), Italian violinist and musical composer, born at Fontanetto in Piedmont. He appeared with much success in Germany, Russia, and England before settling in Paris (1782). From 1795 he resided chiefly in London, where he died. He was the greatest violinist of his time.



Viper's Bugloss.

1, Corolla laid open; 2, pistil.

Many of his compositions are still standard works.

Viper (*Vipera*), a genus of poisonous snakes, including about ten species found in Europe, Asia, and Africa. For the British species see ADDER. In India and in neighbouring countries there occurs the dangerous Russell's viper or daboia (*V. Russellii*), which

reaches a length of five feet. To the family Viperidæ belong not only the vipers and their allies, but also the deadly rattlesnakes. To the subfamily Viperinæ, which is confined exclusively to the Old World, belong not only the vipers in the restricted sense, but also the puff adder (*Bitis arietans*) of Africa and the African horned vipers (*Cerastes*).

Viper's Bugloss (*Echium vulgare*), a native British plant belonging to the order Boraginaceæ. It is found growing on walls, in gravel pits, and similar places. It is a bristly plant, growing to three feet in height; has narrow, prickly leaves, and bears numerous short curved spikes of blue flowers in summer.

Vipsania, daughter of M. Vipsanius Agrippa and wife of Tiberius, bore the latter a son, Drusus; but in 11 B.C. Augustus caused them to be divorced, in order that Tiberius might marry his daughter Julia. Vipsania died in 20 A.D.

Vipsanius. See AGRIPPA.

Viramgam, munic. tn., Ahmadabad dist., Bombay Presidency, India, 37 m. w. of Ahmadabad; an important cotton entrepôt. Pop. (1901) 18,952.

Viravanallur, tn., Tinnevely dist., Madras Presidency, India, 12 m. s.w. of Tinnevely. Pop. (1901) 17,327.



Rudolf Virchow.

(Photo by Elliott & Fry.)

Virchow, RUDOLF (1821-1902), German anthropologist, pathologist, and politician, was born at Schivelbein, Pomerania. He was appointed prosecutor to the University of Berlin in 1847, and the same year sent by the government to investigate typhus fever in Silesia. His report was so outspoken as to cause a good deal of official disquiet; and his demo-

cratic creed brought about the loss of his university appointment. He had already founded (1847) the *Archiv für Pathologische Anatomie*, which he edited until his death. He was largely responsible for the encouragement given to Schliemann in his excavations at Troy; and he wrote two books on Troy, *Zur Landeskunde der Troas* (1880) and *Alttröjanische Gräber und Schädel* (1882). On losing his appointment in Berlin he was offered the chair of pathological anatomy at Würzburg (1849), and there he remained until, in 1856, Berlin University invited him to return. The pathological museum of the Berlin University is one of the many monuments that demonstrate Virchow's industry. His great work on *Cellular Pathology* (1858; Eng. trans. 1860), and that on *Tumours*, which was never completed (1863-67), are his best-known books; but there is practically no department of medicine on which he has not spoken learnedly. In his *Cellular Pathology* he took for his motto 'Omnis cellula e cellula' ('All cells from a cell'); and that was the theory, or rather the fact, on which all his medical work was based, and he was the first to apply the cell theory to the consideration of diseased tissues. He for a long time led the Radical party in the Prussian Chamber, and was a constant opponent of Bismarck.

Virgil (70-19 B.C.), whose full name was Publius Vergilius Maro, the greatest of Roman poets, was a native of Andes, near Mantua. The correct spelling of the name in Latin is with an e, not with an i; the spelling Virgilius is first found in the 5th century A.D., and acquired vogue after the 9th century. He was given a good education at Milan and in Rome (after 53 B.C.), where the Emperor Augustus was, it is said, his fellow-pupil. In 41 he went to Rome, and became one of Mæcenæ's circle of friends, among the members of which were the poets Horace and Varius. The rest of his life was spent in literary work and study: his *Georgics* appeared about 30 B.C., and his remaining years were devoted to the composition of his *Æneid*. He died at Brundisium. The *Bucolics*, mostly descriptive of rustic life, are imitations, almost translations, from Theocritus. The *Georgics* deal with agriculture, arboriculture, domestic animals, and bees and bee-keeping. It is a didactic poem, much influenced by Hesiod; but the skill with which the topics are elevated and idealized, and the beauty of its episodes, make it the most perfect of the greater works of Roman poetry. The *Æneid*, begun in 29 B.C., was left unfinished at the

poet's death. Its subject is the settlement of Æneas in Italy after the destruction of Troy. The first six books resemble the *Odyssey*, the last six the *Iliad*; but the fourth owes much to Apollonius Rhodius's *Argonautica*. The story of Æneas was not a living Roman legend, though it had been officially adopted at Rome for two centuries; and



Bust of Virgil.

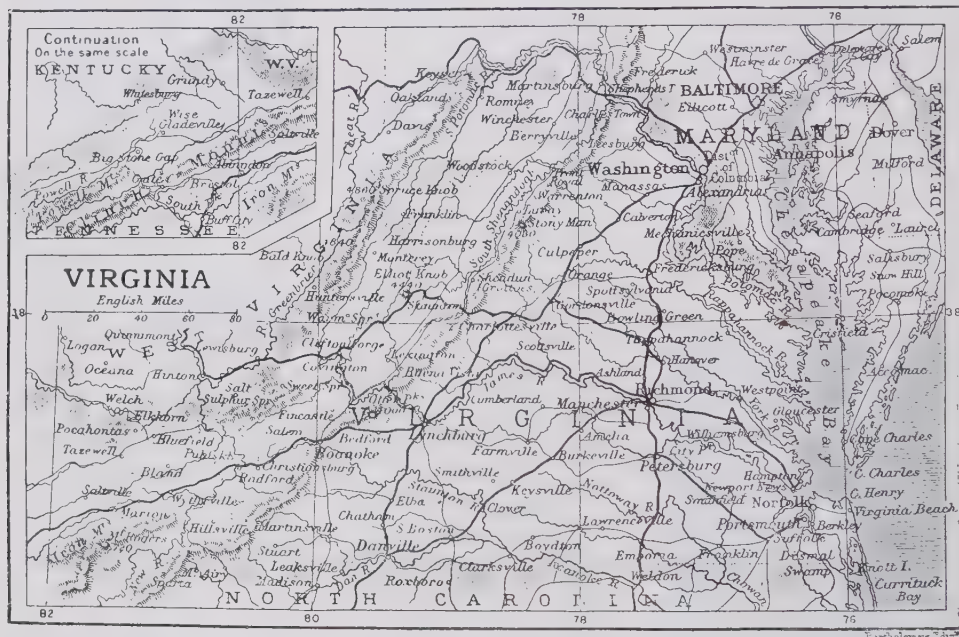
Virgil himself was not naturally fitted to be an epic poet. Hence there is an air of effort and unreality about the whole work; the battle scenes, above all, are clearly written by a student, not by a man of action: the imitation of Homer is too obvious. Yet the poem remains the noblest monument of Roman character and of Roman poetic genius. One great charm of the poem is the frequent expression in perfect language of thoughts, common indeed, which touch the human heart in every age; and above all, there is the unsurpassable Roman dignity which colours the whole poem, maintained and expressed by the poet's perfect command of language and rhythm. From the point of mere style the poem has never been surpassed. The minor works ascribed to Virgil are *Culex* and *Ciris*, two small epic poems; *Moretum*, a description of a peasant's breakfast; *Copa*, 'mine hostess,' a short elegiac poem in a sprightly tone; and *Catalepton*, short poems on various subjects. Of all these poems no more can be said here than that they date from Virgil's time, and quite well may be his work. Virgil at once gained the greatest reputation;

his works were regularly studied in schools, and later consulted as oracles. In the middle ages Dante regarded Virgil as his chief teacher, and in popular tradition he was considered the greatest of magicians and necromancers owing to the use of his poems as oracles. The scene of his exploits was Naples, which, as the place of his burial, was the origin of these legends. For these, see Jean d'Outremeuse's *Les Faits Merveilleux de Virgile*, a 15th-century work (modern ed. 1867), and Comparetti's *Virgil in the Middle Ages* (1872). Good editions of Virgil have been published—the text, by Ribbeck (new ed. 1895), Nettleship (1890), Page (1895), Papillon and Haigh (1895);

Virginia, one of the eastern states of the United States of America, with an area of 42,450 sq. m. It was one of the thirteen colonies and an original state. It fronts on the Atlantic, and extends to the Alleghany range in the Appalachian Mts. Its eastern part is low and level, and near the coast contains marshlands, the largest being the Dismal Swamp. Further inland the contour rises and becomes more broken. The Blue Ridge, the easternmost member of the Appalachian system, crosses the state in a south-westerly direction, reaching altitudes of 4,000 ft. West of it is a broad valley, drained by the Shenandoah, James, and New rivers, and

formed only one per cent., while negroes numbered 660,722, or 35·6 per cent.

Virginia, a maiden of ancient Rome. In 449 B.C. Appius Claudius, chief of the decemvirs, ordered a client of his, M. Claudius, to claim Virginia, the daughter of a slave of his. The case was brought before Appius; but when he adjudged Virginia to his client, a riot ensued. Virginia's father, Virginius, seeing no other escape for his child, snatched up a butcher's knife from a stall, and plunged it into her bosom. He then escaped and inflamed the army with the tale, and soldiers and citizens rose against the decemvirs. Appius was imprisoned, and killed himself in prison. The



and with notes, by Conington and Nettleship (1881-4), Sidgwick (1890), Papillon and Haigh (1890-1). Translations have been made into English verse by Dryden (1697), Palmer (*Bucolics*, 1883), Bowen (*Bucolics* and *Aeneid*, i-vi. 1889), Conington (*Aeneid*, 1870), Morris (*Aeneid*, 1876); and into English prose by Conington (1888), Mackail (1885 and 1889). See also Henry's *Aeneidea* (1873-92), Nettleship's *Introduction to the Study of Virgil and Ancient Lives of Virgil* (1879), Sellar's *Roman Poets of the Augustan Age* (1877).

Virgil, POLYDOR. See VERGIL.

Virginal. See SPINET.

Virginia, WEST. See WEST VIRGINIA.

branches of the Tennessee, and intersected by numerous parallel ridges. The largest rivers are the Potomac, on the northern boundary, the Rappahannock, James, Appomattox, Roanoke (Staunton), and New. The capital and largest city is Richmond, at the head of navigation on the James. The chief ports are Norfolk and Newport News. The industries are to a great extent agricultural. The principal crops are tobacco, cotton, Indian corn, wheat, and oats. The principal manufactured products are tobacco, flour, lumber, iron and steel, and steam cars. The mineral wealth consists mainly of iron ore and coal. Pop. (1900) 1,854,184. The foreign-born

story is, however, probably only an invention to explain the fall of the decemvirate. It is well told in Macaulay's *Lays of Ancient Rome*.

Virginia Creeper, a group of hardy climbing shrubs belonging to the order Vitaceae. They may be distinguished from the allied plants belonging to the genus *Vitis* by the pith of their branches being white, whilst that of *Vitis* is brown. They may be easily propagated by cuttings taken in September and placed in sandy soil under hand-glasses. The Virginia creepers are largely cultivated owing to the rapidity of their growth and to the habit of their leaves of turning a beautiful red colour in autumn.

Veitch's Virginia creeper (*Ampelopsis Veitchii*) is about the best for clinging to walls. It bears the atmosphere of cities well.

Virginian Deer (*Cariacus virginianus*), a type of the American deer of the genus *Cariacus*, in which the antlers are either in the form of simple spikes, or, when branched, have no brow tine, always divide in a forklike fashion, and have the anterior prong directed forwards. The animal ranges throughout N. America, and occurs in several well-marked varieties, which are sometimes given specific rank. The general body colour in summer is bright bay, whence the common name of 'red deer.' In winter the colour becomes gray.



Virginian Deer.

Virginian Quail, or BOB-WHITE (*Ortyx virginianus*), a member of the subfamily Odontophorinæ, which includes American game birds that are quail-like in appearance and are sometimes called partridges. The bob-white is found in the eastern United States, and receives its name from the note of the male. It is partridge-like in its habits, and an attempt has been made to introduce it into England, but without success.

Virginian Stock (*Malcomia maritima*), a hardy annual European plant, belonging to the order Cruciferae. It bears racemes of white, lilac, or rose-coloured flowers, with a sweet fragrance. It is of the easiest culture in nearly all soils.

Virginia University, at Charlottesville, Virginia, U.S.A., founded (1819) by President Jefferson and opened in 1825. The buildings were planned and erected under his personal supervision, and form one of the finest pieces of academic architecture in America. The students numbered 700 in 1904-5.

Virginia Water, lake in the Great Park of Windsor, Berkshire, England, 5 m. S. of the castle; was constructed in 1746 by the Duke of Cumberland.

Virgin Islands, the most northern group of the Lesser Antilles,

were discovered by Columbus in 1494. The largest are Crab or Vieques, Culebra, St. Thomas, St. John, Sainte Croix, Tortola, Virgin Gorda, and Anegada. They are all mountainous, projecting above the water like tips of submerged peaks, and are very rugged. The total area aggregates 270 sq. m. The total population is about 100,000. Crab and Culebra were Spanish, but now belong to the United States. The Danes own St. Thomas, Sainte Croix, and St. John. Anegada, Virgin Gorda, Tortola, and a number of smaller islands, belong to Great Britain. The majority of the population are negroes. The town of St. Thomas was formerly the commercial metropolis of the W. Indies.

Virgin Mary. See MARY, THE VIRGIN.

Virgo, the sixth sign of the Zodiac (symbol ♍), entered by the sun about August 21, and an ancient constellation. The figure primitively represented the Euphratean goddess Ishtar; but Aratus identified it with Astræa, other Greek writers with Demeter or Persephone. Its harvesting associations survive in the name Spica of the principal star; while ϵ , of 3rd magnitude, is designated Vindemiatrix in the Alfonsine Tables. The fine binary γ Virginis is composed of two straw-yellow stars of 3⁶ magnitude, both slightly variable, mutually revolving in 180 years. The great nebulous region centred on the north galactic pole covers the head and breast of Virgo. The most remarkable of the objects collected there is the large spiral, Messier 99, photographed by Dr. Roberts in 1896.

Viriathus, a native of Lusitania—roughly Portugal—who gained command of his tribe in 147 B.C., and in that year defeated a Roman proprætor, destroying 4,000 out of 10,000 Romans. Next year he defeated the prætor Plautius, and in 145 Claudius, though later in that year the consul Fabius expelled him from the Roman provinces in Spain. In 141 B.C. Viriathus surrounded the army of the proconsul Servilianus; but the latter made a treaty with him recognizing the independence of Lusitania. Next year, however, the consul Servilius Cæpio renewed the war, and successfully bribed the envoys whom Viriathus sent to him to murder their general.

Viridian, or GUIGNET'S GREEN, a hydrated chromic oxide, obtained by decomposing borate of chromium with water. It is a permanent, harmless, and rich-coloured pigment.

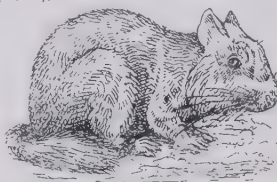
Virtues. See CARDINAL VIRTUES.

Virues, CRISTOVAL DE (c. 1550-1619), Spanish dramatic and epic poet, born at Valencia, was an intimate friend of Lope de Vega. Like Lope, he followed for some time the profession of a soldier; but between 1579 and 1581 he wrote five famous tragedies (first printed 1609), by name *Cassandra*, *Marcella*, *El Atila Furioso*, *Semiramis*, and *Elisa Dido*; an epic poem, *Monteserrate*; and a number of lyrics.

Virus, in medicine, the poison produced in the body when suffering from an infectious disease. It can, by inoculation, excite the same disease in another. See BACTERIOLOGY, POISONS, VACCINATION, INFECTION.

Visby. See WISBY.

Viscachas, or PAMPAS HARE (*Lagostomus trichodactylus*), a South American rodent, nearly allied to the chinchilla, but found only in the open pampas. Viscachas have five toes on the fore feet and three on the hind, and are strongly and somewhat clumsily built. They are social forms, and construct elaborate warrens. They are much disliked by the sheep-farmers, whose pastures they destroy. Owls and other birds live in or near the burrows. The length of the head and body in a full-grown animal is about twenty-three inches, the tail being about seven inches. See Hudson's *Naturalist in La Plata* (1892).



Viscachas.

Vischer, FRIEDRICH THEODOR VON (1807-37), German writer on æsthetics and philosophy, born at Ludwigsburg in Württemberg; became professor of æsthetics at Tübingen (1837), and was elected a member of the Parliament of Frankfurt (1848). He was promoted to a professorship at Zürich (1855), and occupied a similar post at Stuttgart (1866-77). His principal works are *Ästhetik* (3 vols. 1847-58); the novel *Auch Einer* (1878); *Altes und Neues* (1881-9); *Kritische Gänge* (1844-75); and, under the pseudonym of 'Schartenmeyer,' the poem *Der Deutsche Krieg, 1870-71* (4th ed. 1874). See *Lives*, by Günther (1888), Frapan (1889), Ziegler (1893), and Oswald (1896).

Vischer, PETER (1455-1529), German sculptor, was born at Nuremberg, and executed the monument of Archbishop Ernst

at Magdeburg (1497), of King Arthur at Innsbruck, and 'the tomb of St. Sebald at Nuremberg (1508-19). He had five sons, all eminent sculptors, the eldest of them, Hermann (d. 1516), being the best known. See Bergau's *'Peter Vischer und seine Söhne'* in Dohme's *Kunst und Künstler*.

Visconti, a noble Lombard family, which is first mentioned in the 11th century. OTTONE (b. 1208) became the first lord of Milan, having headed the Ghibellines and defeated the Della Torre (who, however, resumed sway for a short period—1302-11). GALEAZZO (1277-1328) extended his dominion over Lombardy. LUCCHINO (b. 1287, murdered 1349) was a harsh but successful ruler, and a patron of arts and letters, receiving, among others, Petrarch at his court. The succeeding princes lost much of their territory, but everything was won back by the greatest of the Visconti, GIAN GALEAZZO (c. 1347-1402), who did a great deal for art, literature, and science at Milan, Pavia, and Piacenza. When he died (of the plague) he was aspiring to the kingdom of Italy. (See monographs by Belgioioso, 1861; and Romano, 1891.) His daughter VALENTINE (d. 1408) married in 1389 Louis, Duke of Orleans; and it was on the strength of this marriage that Louis XII. of France eventually claimed Milan. With their third son, FILIPPO MARIA (1391-1447), the male line of the Visconti died out. His daughter, MARIA BIANCA (d. 1468), married Francesco Sforza.

Visconti-Venosta, EMILIO, MARQUIS (1830), Italian statesman, born at Milan; became a follower of Mazzini, but left the conspirators in 1853, and in 1859 was appointed royal commissioner with the forces of Garibaldi. He was foreign minister in the Minghetti cabinet (1863-4), and in the Lanza-Sella cabinet (1869-76). In 1886 he was appointed senator, and in 1896 he accepted the portfolio of foreign affairs in the Rudini cabinet, and again in 1899 in the Pelloux and Saracco cabinets till 1901. In 1906 he was selected to represent Italy at the Morocco conference which met at Algieras. In 1904 he published *Ricordi di Gioventù*.

Viscosity, the property of matter in virtue of which it resists, but at the same time yields under the action of shearing forces. It differs from elasticity inasmuch, as it does not imply any power of recovery when the distorting force is removed. Viscosity is specially marked in fluids, and is sometimes called fluid friction. Its effect is to destroy all relative motion in the fluid. The decay of waves, the lulling of wind, are

examples of the effects of viscosity. Fluids differ greatly in the amount of their viscosity, from extremely mobile liquids such as ethyl ether or water to highly viscous fluids such as glycerin, tar, or treacle. In the case of gases and liquids viscosity is due to the diffusion of molecules between contiguous layers which are moving with different speeds. The more energetic molecules of the more quickly moving layer pass into the more sluggish layer, and increase its momentum. Similarly the more sluggish molecules move into the more rapid layer, and decrease its momentum. Viscosity, in fact, is defined as the diffusion of momentum. When a wire is set oscillating either flexurally or torsionally, it gradually loses energy and comes

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Elements of 'Visible Speech.'

to rest. This loss is due partly to the friction of the air through which it moves, and partly to the viscosity of the solid material itself.

Viscount, a sheriff who acted as deputy for the count, or lieutenant, of a county; older in this sense than as a title of nobility ranking between earl and baron, and first bestowed (1440) by Henry VI. on John Beaumont. In Jersey it means an officer of the crown, like an English coroner.

Viscum, a genus of parasitic shrubs, belonging to the order Loranthaceae. They grow on the branches of trees and live at their expense. They bear fascicles of flowers, dioecious or monoecious. The common mistletoe is *V. album*.

Vishni-Volotchok, tn., gov. Tver, Russia, 69 m. N.W. of Tver. Pop. (1897) 17,500.

Vishnu, the second person of the Trimurti, or trinity of Hinduism, is identical with the primeval essence which, before created things, moved on the face of the waters. He was first deified as the sun, whence, on taking his place among the Triad, he is described as the preserver of life. Four of his earliest alleged incarnations—a fish, a tortoise, a boar, and a man-lion—took place at a very remote period of the world's history. In four subsequent incarnations Vishnu took human shape, and is described as visiting the earth to do battle with evil or to avert disaster. It is as Rāma and Krishna, sympathizing personal deities, that Vishnu appeals to the popular hearts and minds of Hindus. The ninth incarnation, Buddha, was

without doubt added by Brahman theologians as a sop to weak-kneed Buddhists. A tenth incarnation, Hindus believe, is reserved for the last day, when Vishnu is to return to earth to execute righteousness and judgment.

Vishnupurana. See PURANA.

Visible Speech, a method of representing speech sounds by means of alphabetic signs depicting the shape of the mouth in uttering them. Thus **O** represents the throat open, **0** contracted to a whisper. **I**, **ɪ** are the stems of all vowels, and **C**=mouth contracted, and **E**=mouth divided, the stems of all consonants. **X**=the closed glottal catch. The ten radical symbols from which all vowels (20) and consonants (16) are formed are as follows:—

By this method deaf mutes have been taught to read, and difficult words in unknown languages pronounced. The system was first made known by A. M. Bell in 1867 through *Visible Speech*; *The Science of Universal Alphabets, or Self-interpreting Physiological Letters for the Writing of all Languages in One Alphabet*. It was, however, preceded by *Principles of Speech* (1849), containing the germ of the idea, and the new system of letters was completed in 1864.

Visigoths. See GOTHs.

Vision. Upon the retina of the human eye rays of light proceeding from external objects are brought to a focus, and produce a miniature of the external scene similar to, that thrown on the ground glass screen of a photographic camera. The media and dioptric mechanism by means of which the rays of light are focussed on the retina have been described in the article EYE. When the normal eye is at rest, parallel rays of light are brought to a focus on the retina, and all rays of light coming from six metres or beyond diverge so little that they may be regarded as parallel. From objects within that range, however, the rays diverge so much that the refractive power of the lens must be increased in order to bring them to a focus upon the retina. The power of accommodation is limited, and decreases with age, so that rays from objects brought too near the eye cannot be focussed, and blurred vision results. The range of vision for distant objects is practically infinite, though the eyes of certain insects seem to

be stimulated by rays invisible to man.

The duration of a stimulus necessary to produce sensation is exceedingly short; but once produced, the sensation persists as an after-image for a comparatively lengthy period. Distinct vision must be regarded as due to a division of the retina into sensational units. The differentiation of sensational units, however, is primarily determined by the cerebral centres, which receive the impulses from the retina. Singleness of vision with two eyes depends on the association of certain parts of each retina with the other. The ordinary movements of the eyeballs bring the visual axes of the eyes to converge upon an object, so that the two images fall on corresponding points. The association of corresponding areas prevents the blind spot in each eye from being noticeable in ordinary vision. Binocular vision increases the facility with which size, distance, and solidity of objects are estimated, and its advantages are well illustrated by the stereoscope.

The discrimination of colour is most acute around the yellow spot, where over two hundred tints may be distinguished. The colour of an object is due to its power of reflection or absorption of certain rays. Two theories, the Young-Helmholtz and the Hering, have been advanced to account for colour sensation and colour perception. According to the first, rays of different wave lengths initiate diverse molecular vibrations around the sensory nerve fibrils, which convey correspondingly varied impressions to the visual centres. According to the second, different rays produce diverse chemical changes, which in their turn stimulate the nerve fibrils in distinctive fashion. The chemical changes are assumed to be of a catabolic nature, and once initiated they persist for a time, so that an after-image results. A negative after-image follows when the reparative anabolic changes are renewing the sensitive material. Neither theory, however, is without its difficulties. See Foster's *Physiology* (1894), Landois and Stirling's *Physiology* (1891), Juler's *Ophthalmic Science and Practice* (1884).

Visions. See SPIRITUALISM, PSYCHICAL RESEARCH.

Visit and Search. In time of peace piracy and the slave trade are the evils guarded against, and in time of war the use of neutral flags to cover merchant vessels of a belligerent, or the conveyance of contraband of war by neutral ships. The continental powers contend that neutral vessels under convoy are not liable to visit and search, but Great Britain

has never formally accepted this doctrine. Neutral vessels of war are not subject to this right. On the occurrence of a visit the ship's papers—such as register, log, charter-party, etc.—must be produced. If these are found to be in order, the vessel is allowed to proceed upon her voyage; but if there is reason for suspicion, she may be subjected to a detailed search. If she resists the visit and search, or it appears that she or any part of her cargo is liable to seizure as a prize, she is detained and brought before a prize court of the capturing belligerent. Special rights of visit and search exist under the North Sea Fisheries Convention, for the purpose of putting a stop to 'coopering,' or the illicit providing of spirits to fishing vessels in the North Sea.

Visitation, ORDER OF THE. See FRANCIS, ST., OF SALES.

Visitation of the Blessed Virgin Mary, a festival originating in France in the 13th century, commemorates the visit of Mary to Elisabeth. The Council of Basel in 1441 enjoined its observance. It was admitted to the York Calendar in 1526. It appears in the English Church almanac at the date July 2.

Visitor. All corporations are said to be subject to visitation. Ecclesiastical corporations are visited by the canonical superior—i.e. the crown visits the archbishop, the archbishop the bishops, and so on; but the only ecclesiastical visitation now practised is that of the parishes by the archdeacon. The only visitor of a civil corporation is the crown, which visits through the medium of the Court of King's Bench. In eleemosynary corporations—e.g. colleges at Oxford and Cambridge—the visitor is the founder, his heirs or appointees, or in default the crown. By the Endowed Schools Act, 1869, the Charity Commissioners may transfer (except in the case of cathedral schools) the right of visitation to the crown, to be exercised through them. The judges are visitors of the Inns of Court. The visitor is the final court of appeal on all matters affecting the body of which he is visitor.

Visnea, a genus of evergreen trees belonging to the order Ternstroemiaceæ. The only species, *V. mocanera*, is a native of the Canary Is., and is sometimes cultivated in greenhouses in Britain. It bears small flowers, which are succeeded by indehiscent berries, supposed by Linnaeus to have been the mocan, the syrup of which was employed by the aboriginal inhabitants of the Canary Is.

Viso, MONTE, the culminating point of the Cottian Alps (12,609 ft.), is a fine rocky pyramid, that

rises (just in Italy) at the head of the valley of the Po, and is very conspicuous from Turin. It was scaled in 1861 by W. Mathews and F. W. Jacomb.

Vison. See MINK.

Visp, or VISPACH, picturesque vil., Switzerland, canton Valais, in the Rhone valley, 6 m. W.S.W. of Brieg. Pop. (1900) 940.

Vistula (Ger. *Weichsel*), riv. of central Europe, rises in the Carpathians, and flows N., describing a curve to the E., then another to the W. It divides Silesia from Galicia, and Galicia from Russian Poland, traverses or separates the Polish-Russian provinces of Radom, Lublin, Siedlec, Warsaw, and Plock, and leaves Russian territory a little above Thorn. It enters the Baltic lagoon of the Frisches Haff between Danzig and Königsberg. Its principal tributaries are the San, Wieprz, Bug, and Drewenz. Length, 650 m.; its basin has an area of 73,400 sq. m. It becomes navigable at Cracow.

Vit, VINCENZO DE (1811-92), Italian scholar, born at Padua, became a canon and afterwards librarian of Rovigo, attaching himself to the brotherhood of Rosmini. He was the author of works on philology, history, and archæology, his best-known publication being the *Onomasticon*, a treatise on proper names (to the letter O) from the earliest times to the 5th century. He edited (with a supplemental volume) Forcellini's *Lexicon Totius Latinitatis* (1858-79).

Vitalis, ORDERICUS. See ORDERICUS VITALIS.

Vital Statistics, a term sometimes applied to statistics of population generally, but more properly confined to the figures relating to births, marriages, and deaths. These are collected in two ways. The first method is by enumeration at the census. The other and far more accurate method is that of registration, which is made compulsory within a few days of the event recorded. From these registration statistics, which are periodically published, interim estimates of the population are made. The following tables give examples of the data usually presented under the heading of vital statistics:—

Density of Population of the British Empire.	
Territory.	Persons per sq. mile.
United Kingdom.....	342·4
Isle of Man and Channel Islands.....	496·3
Indian Empire.....	172·0
West Indies and Central America.....	82·5
West Africa.....	52·0
New Zealand.....	7·8
South Africa.....	4·1
North America.....	1·4
Australian Commonwealth....	1·3

Births, Deaths, and Marriages.

Total number, and rate per 1,000 of population, of births, deaths, and marriages in each division of the United Kingdom.

BIRTHS.

Years.	England and Wales.		Scotland.		Ireland.		United Kingdom.	
1901	929,807	28.5	132,192	29.5	100,976	22.7	1,162,975	28.0
1902	940,509	28.5	132,267	29.2	101,863	23.0	1,174,639	28.0
1903	948,271	28.4	133,499	29.2	101,831	23.1	1,183,601	27.9
1904	944,703	28.0	132,570	28.6	103,773	23.6	1,181,046	27.6

DEATHS.

Years.	England and Wales.		Scotland.		Ireland.		United Kingdom.	
1901	551,555	16.9	80,107	17.9	79,119	17.8	710,811	17.1
1902	535,538	16.2	77,941	17.2	77,676	17.5	691,155	16.5
1903	514,628	15.4	75,973	16.6	77,358	17.5	667,959	15.8
1904	549,393	16.3	77,961	16.8	79,602	18.1	706,956	16.5

MARRIAGES.

Years.	England and Wales.		Scotland.		Ireland.		United Kingdom.	
1901	259,400	15.9	31,387	14.0	22,564	10.2	313,351	15.1
1902	261,750	15.9	31,913	14.1	22,949	10.4	316,612	15.1
1903	261,103	15.6	32,320	14.1	22,992	10.4	316,415	14.9
1904	257,496	15.3	32,253	13.9	22,783	10.4	312,532	14.6

Proportions of Unmarried, Married, and Widowed in the United Kingdom and in some of our principal Colonies and Dependencies.

	Proportion per 1,000 living.		
	Unmar.	Mar.	Wid.
United Kingdom....	609	334	57
Indian Empire.....	419	465	116
Cape of Good Hope..	649	307	44
Natal (natives excepted).....	588	384	28
Orange River Colony..	664	309	27
Canada.....	617	341	42
Newfoundland.....	617	337	46
New South Wales....	657	303	40
Victoria.....	647	300	53
Queensland.....	677	289	34
South Australia.....	652	304	44
West Australia.....	647	320	33
Tasmania.....	660	298	42
New Zealand.....	657	306	37

For statistics relating to the total estimated population in each of the principal countries, and of births, deaths, and marriages in each country, see 'Statistical Abstract for the Principal and other Foreign Countries in each Year from 1893 to 1902-3,' Parliamentary Blue-book for 1905, which also contains the 'Emigration Statistics' for the various countries. Briefly, the comparative birth and death rates of the principal countries are:—

Country.	Births per 1,000.	Deaths per 1,000.
England and Wales.....	27	15
Scotland.....	28	16
Ireland.....	23	18
United Kingdom.....	28	17
Denmark.....	29	15

Country.	Births per 1,000.	Deaths per 1,000.
Norway.....	29	14
Sweden.....	26	15
Austria.....	37	25
Hungary.....	39	27
Servia.....	38	22
Roumania.....	39	28
Bulgaria.....	42	22
Switzerland.....	23	17
Germany.....	35	19
Netherlands.....	32	16
Belgium.....	23	17
France.....	22	20
Spain.....	34	29
Portugal.....	30	20
Italy.....	33	22
United States.....	27	16
Uruguay.....	33	13
Australia.....	25	12
New Zealand.....	27	10
Japan.....	32	20

For other statistics see the carefully-compiled figures for each country in the *Statesman's Year-Book* (annual).

Vitebsk. (1.) Government, Central Russia, with Courland on s.w.; area, 17,440 sq. m. The surface is an undulating plain, which belongs to the basins of Lakes Peipus (Chudskoe) and Ilmen, and the W. Dwina. Lakes and marshes are numerous, the latter being very extensive. The chief crops are oats and rye; then come potatoes and flax. Orchards and nurseries are fairly prosperous. Domestic industries are mainly concerned with timber. The greater industrial establishments include paper, saw, and flour mills, tanneries, distilleries, and tobacco manufactories. Of the

population 63 per cent. are Russians and Orthodox (mostly White Russians); 23 per cent. Letts, Poles, and Catholics; 10 per cent. Jews. Vitebsk formed a separate principality from the 11th to the 13th century; in the 14th century it was conquered by Lithuania. Pop. (1897) 1,502,916. (2.) Town, Central Russia, cap. of Vitebsk gov., on W. Dwina (Düna), 80 m. W.N.W. of Smolensk. It is a river port and episcopal see, with a cathedral of St. Nicholas (1664) and churches of St. Elias (1643—a fine example of Old Russian style), the Assumption (1777), and St. Antony (1731). It has dye works, and manufactures candles, vinegar, mineral waters, tobacco, varnish, woollen and linen cloth. Pop. (1897) 66,143, largely Jews.

Vitellius, AULUS (15-69 A.D.), emperor of Rome from Jan. 3 to Dec. 20, 69 A.D., was consul in 48 A.D., and afterwards proconsul of Africa for one year. Galba gave him the command of the troops in Lower Germany in 68 A.D. He was soon persuaded by Valens to aim at the throne, and Valens and Cæcina defeated his rival Otho at the first battle of Bedriacum (April 69). Vitellius reached Rome in July; but at the same time Vespasian was proclaimed emperor in the East. In October his troops defeated the Vitellians in the second battle of Bedriacum, and marching on Rome killed Vitellius.

Viterbo, tn., Rome prov., Latium, Italy, 40 m. N.N.W. of Rome; has manufactures of soap, paper, leather, and matches. It is surrounded by ancient Lombard fortifications, and near it are Etruscan cemeteries. The cathedral is Romanesque Gothic. Viterbo was frequently a papal residence. Pop. (1901) 21,258.

Vitet, LUDOVIC (1802-73), French writer and politician, born in Paris; was appointed by Guizot inspector-general of monuments (1830). He became secretary to the minister of commerce and a deputy (1834), and a councillor of state (1836). In 1845 he succeeded Soumet as a member of the Academy. The *coup d'état* (Dec. 2, 1851) compelled him to retire into private life. His works include *Histoire des Anciennes Villes de France* (1833), *Histoire de Dieppe* (1838), and *Les États d'Orléans* (1849).

Vitex, a genus of trees and shrubs belonging to the order Verbenaceæ. They bear cymes of white, blue, or yellow flowers, the corollas being more or less bilabiate. The tree of chastity, or monk's pepper tree (*V. Agnus castus*), is hardy in the milder and more sheltered parts of Britain. It is a large shrub, bearing white flowers in late summer.

Viti. See FIJI.

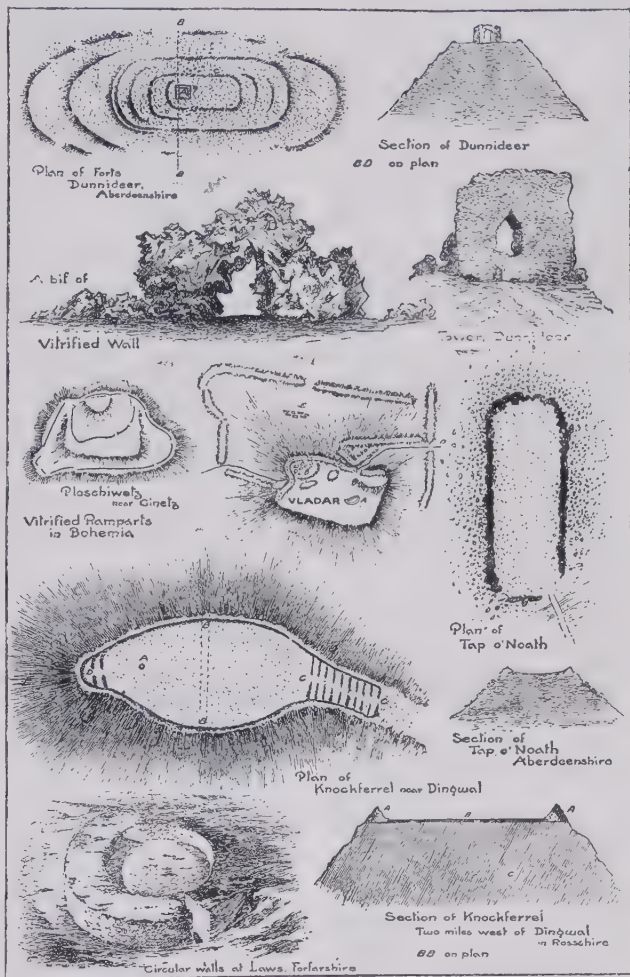
Vitis, a genus of mostly climbing shrubs, belonging to the order Ampelidaceæ. They bear small flowers, followed by ovoid or globose berries. The best known species is *V. vinifera*, the grape vine. (See VINE.) Other varieties are *V. arifolia* (parsley-leaved vine), with delicately and deeply-cut foliage; and *V. purpurea*, with its leaves coloured deep purple all through the summer and autumn. A vine which has been grown in English gardens since the middle of the 17th century is the North American *V.estivalis*, or summer grape; in some autumns it takes on a brilliant red colour. Another old species introduced into Britain two hundred years ago is the tree vine (*V. arborea*), with beautiful, deeply-divided foliage. One of the best and most vigorous of the American species is the northern fox grape (*V. labrusca*), the leaves of which, however, usually fail to colour in autumn. None of the true American grape vines take on so rich an autumn tint as some of the varieties of Ampelopsis—now classed among the vines—though the strong-growing *V. californica* is a near rival in that respect. But even the old Virginian creeper is surpassed by the well-known Asiatic species, *Ampelopsis Veitchii*. Of the true Asiatic vines—apart from the varieties of *V. vinifera*—the one most frequently grown in England is probably the hop-leaved vine, which possesses delightful foliage. But supreme among the decorative vines is the vigorous, large-leaved Japanese species, *V. Coignetiae*, which in its native home clammers over the tops of the tallest trees, and in autumn assumes every shade of crimson, orange, rose, yellow, and scarlet. Many of the vines, in particular *V. riparia*, a hardy American kind, yield a delicious fragrance. Most of the vines can be easily grown in soil deeply dug, well enriched with rotten manure, and kept moist, yet not water-logged. They are readily increased by means of cuttings or eyes, though *V. Coignetiae* is best raised from imported seeds.

Vitoria, or VITTORIA, cap. of Basque prov. of Alava, Spain, 31 m. s.s.e. of Bilbao; has manufactures of mirrors and picture frames. The cathedral dates from the 12th century. On June 21, 1813, Wellington defeated here the French under Joseph Bonaparte and Jourdain. Pop. (1900) 30,701.

Vitré, tn., dep. Ille-et-Vilaine, France, on l. bk. of Vilaine, 24 m. by rail E. of Rennes; has hosiery factories, iron foundries, and black stone quarries. The town has a quaint Breton appearance, and has a 14th-century castle. Pop. (1901) 8,776.

Vitrified Forts, camps or forts (crowning the summits of hills in certain parts of Central and Western Europe, including the British Isles) whose ramparts of rough, undressed stones are found to have been 'compacted together by the force of fire, and that so effectually that most of the stones have been melted

forts was due to volcanic action, and that the hilltops thus fortified were extinct craters; but this position was speedily abandoned. The 'accidental' theory, however, finds much justification in the fact that, even in good specimens of this kind of fort, there are lacunæ of unvitrified wall; and it is difficult to see why the



Examples of Vitrified Forts.

down.' Thus wrote John Williams in 1777. But portions of the ramparts consist solely of loose stones that have resisted the effort to fuse them together. It has been argued from this that the vitrified portions are merely the result of accident, the effect of blazing watchfires on the walls. The earliest theory was that the peculiar character of the vitrified

builders should designedly consolidate some parts of the wall and not the whole of it. On the other hand, the fort at Carradale, near Campbelltown, Scotland, seems clearly to indicate design on the part of the builders. An ingenious surmise, offered by Lady Ferguson in her *Story of the Irish before the Conquest*, is that a certain 'glass castle' of

Irish tradition 'may possibly have been a vitrified fort.' As to the period in which these structures were reared there is abundant room for conjecture. But as the fort at Peran in Brittany was found to have 'a fragment of a Roman roofing-tile firmly attached to the melted stones of the vitrified wall,' it is evident that that particular fort does not antedate the Roman occupation of Brittany, and not unlikely it was built after the Roman houses were in ruins. See John Williams's *On Highland Ruins* (1777); papers by Dr. John Stuart and Dr. Ferdinand Keller of Zürich, in the *Proceedings of the Society of Antiquaries of Scotland*, vol. viii.; Dr. Angus Smith's *Loch Etive and the Sons of Uisnach* (1879); and Dr. Robert Munro's *Prehistoric Scotland* (1899).

Vitrina, or GLASS-SNAIL, a genus of pulmonate gastropods, in which the shell is thin, depressed, and small, so that it is incapable of lodging the whole of the animal's body. Some of the species are carnivorous. In Britain there occurs *V. pellucida*.

Vitringa, CAMPEGIUS (1659-1722), Dutch Orientalist and theologian, born at Leeuwarden; was the most distinguished pupil of Cocceius, and became professor of Oriental languages (1681), then of theology (1683), at Franeker. His works include *Commentaries* (6 vols. 1683-1708), *De Synagoga Vetere* (1696), *Typus Theologicæ Practicæ* (1716), and *Isaiah* (1714-20).

Vitriol. See SULPHURIC ACID.

Vitro-Varnish Painting, an art almost lost, but apparently practised in Venice in the 15th century. Take varnish highly coloured for painting, and mix with it from 5 to 10 per cent. of burnt-glass powder. This forms a paint, which is applied with a finely-pointed brush, as in gesso-painting. The effect when dry is that of glass in relief, and it can be raised to any height by applying successive coats. The same effect is produced by painting with water-glass, a solution of sodium. Vitro-varnish painting can be applied to any surface.

Vitruvius, whose full name was MARCUS VITRUVIUS POLLIO, author of a treatise on architecture, *De Architectura*. He lived in the reign of Augustus; was a military engineer, and served in Africa. He treats of architecture, of water and aqueducts, of sundials, and of machines. It is largely based on Greek authorities. Editions by Schneider (1807), Rose, and Müller-Stürbing (1867); Eng. trans. by Gwilt (ed. 1860) and Wilkins (1812).

Vitry-le-François, fort. tn., dep. Marne, France, on the Marne, 103 m. E. of Paris; has manufac-

tures of cement, mosaics, and iron founding, and trade in wine and grain. The church of Notre Damedates from the 17th century. De Moivre the mathematician was a native. Pop. (1901) 8,075.

Vittoria, COLONNA. See COLONNA.

Vittorio, tn., prov. Treviso, Italy, 40 m. N. of Venice; has silk mills, and manufactures cement. Vittorio was formed in 1879 by the union of the two rival towns of Ceneda and Serravalle. Pop. (1901) 18,973.

Vittorio Emanuele. See VICTOR EMMANUEL.

Vitus, a Roman saint martyred under Diocletian. His day is June 15. His influence is besought against such diseases as St. Vitus's dance, sudden death, and hydrophobia. He is the patron of dancers.

Vivandière, a woman attached to the French armies who is permitted to sell provisions to the troops. She generally used to wear a dress adopted from the uniform of the regiment to which she was attached. The male vendor has mostly taken her place.

Vivarini, a family of Italian painters, originating in the island of Murano, at Venice. The principal members were—LUIGI or ALVISE, who lived in Venice (1464-1503); ANTONIO (called Antonio da Murano), died c. 1470; BARTOLOMEO (1449-99), the first of the Venetian school to receive from Antonello of Messina the art of painting in oils.

Viverra. See CIVET.

Vives, JUAN LUIS, more generally LUDOVICUS VIVES (1492-1540), Spanish writer and Latinist, born at Valencia; was considered the most learned man of his time, and became tutor to the children of Ferdinand and Isabella. He was a friend of Sir Thomas More and of Erasmus, and was brought (1523) to England by Wolsey to become reader of rhetoric at Corpus Christi College, Oxford, where he lived for many years in great favour with Catherine of Aragon, to whose daughter Mary he taught Latin. On the fall of Wolsey he went to Bruges. His works had much vogue, especially in England; they were translated by Sir R. Moryson, in *Introduction to Wysdome from Vives* (1540); and the *Instruction of a Christian Woman*, one of the most popular books of the century, was translated by Richard Hyrde in the same year; whilst Thomas Paynel translated *The Office and Duty of a Husband* (1550).

Vivien, MERLIN AND. See IDYLLS OF THE KING.

Vivien de Saint-Martin, LOUIS (1802-97), French geographer, born at Caen in Normandy; became a cartographer, and published *Carte Electorale* (1827),

Tables Chronologiques (1827), and *Géographie de France* (1832). He also translated the works of Sir Walter Scott (1836-9), and wrote *Histoire de la Révolution Française* (1840-2), and *Histoire de Napoléon* (1843). But his two greatest achievements are his *Nouveau Dictionnaire de Géographie Universelle* (1879-95), and an *Atlas Universel* to illustrate his *Histoire de la Géographie* (1874).

Vivisection, or the dissection of the living subject, was practised upon human beings by Herophilus (300 B.C.), and down to 1570 criminals were vivisected at Pisa. Although in some French veterinary schools operations are still performed on lower animals in order to promote manual dexterity, vivisection now implies, not dissection in the ordinary sense, but the performance of an operative experiment upon a living animal for the purpose of advancing biological science. In Britain, experiments which inflict pain upon animals may be undertaken only by those teachers and investigators who have obtained a government licence, and vivisectors themselves agree that the experimenter must be a skilled anatomist and physiologist, that anæsthetics should be used to the utmost possible extent, and that mere repetitions of experiments whose object has been attained are unjustifiable. The number of licencees in England and Scotland in 1905 was 381, of whom 122 did not avail themselves of their privilege. Out of a total of 37,935 experiments, 35,429 were of the nature of simple inoculations, hypodermic injections, or similar measures. Of the 2,506 physiological experiments, 1,493 were unattended by pain, the animals having been anæsthetized during the experiment, and having been destroyed before recovery from the anæsthetic, when recovery would have been attended by pain. There remain 1,013 experiments in which the animal was allowed to recover from an operation performed aseptically under an anæsthetic. In Ireland 218 experiments were performed by 10 licencees; these experiments were mainly pathological inoculations. The word experiment covers the use of only one animal, and whenever supputation followed the operation, the animal was destroyed painlessly. These 945 operations embraced the establishment of fistulæ, the section of nerves, the removal of secretory glands, and like measures, and the experiment in such cases was incomplete without observation of the after-effects. But the after-effects would be vitiated were the animal suffering pain, or were its tissues septic.

Vivonne, CATHERINE DE. See RAMBOUILLET.

Vizagapatam, seapt., munic. tn., and cap. of Vizagapatam dist., Madras Presidency, India, 178 m. N.E. of Masulipatam. Exports grain and sugar, and manufactures native cloth, and has ivory, horn, and sandalwood carving. It has a college. Pop. (1901) 40,892. The district has an area of 17,380 sq. m., and a population (1901) of 2,082,662.

Vizcaya, or BISCAY, Basque province of Spain, an entirely mountainous district on Bay of Biscay; largely engaged in iron-mining and ore export. Capital, Bilbao. Area, 836 sq. m.; pop. (1900) 311,361.

Vizetelly, ERNEST ALFRED (1853), English journalist and publisher. During the Franco-German war of 1870-1 he acted as correspondent for three London journals. In 1886 he was reader for Vizetelly and Co., and on the liquidation of the firm resumed journalism. He has written three novels, *The Scorpion* (1894), *A Path of Thorns* (1901), *The Lover's Progress* (1902); also *With Zola in England* (1899), *Emile Zola* (1904), and other works.

Vizetelly, FRANK HORACE (1864), English publisher and author, brother of the above, born in London; has been on the editorial staff of many productions—e.g. the *Standard Dictionary* (1890-1903), *Columbian Encyclopedia* and *Appleton's Annual* (1896), *Cyclopedia of Dates* (1899), and *Jewish Encyclopedia* (1901-5). His works include *The Crime of the Congo*, *The Boer as a Prisoner of War*, and *Boer Detention Camps in Bermuda* (1901-2).

Vizetelly, HENRY (1820-94), English illustrated press pioneer, born in London; successfully started the *Pictorial Times* (1843) and the *Illustrated Times* (1855). He became Paris correspondent of the *Illustrated London News* (1865), remaining there during the siege, and afterwards publishing *Paris in Peril* (1882). *The Man with the Iron Mask* (1870) was followed by several manuals on wine, *Berlin under the New Empire* (1879) and an edition of *Memoirs of Grammont* (1889). Vizetelly had now started publishing, particularizing in translations from French and Russian. He was fined for publishing obscene libels (1888), and a year later was imprisoned for the same offence. His last work was *Glances Back through Seventy Years* (1893).

Vizianagram, tn., Vizagapatam dist., Madras Presidency, India, 30 m. N.E. of Vizagapatam. It is a military cantonment and the residence of the maharajah. Pop. (1901) 37,270.

Vizier, the chief political officer of the early caliphs (750); adopted (1328) by the Ottomans, and assigned to the highest official at the Mogul court of Delhi and in other Mohammedan states. Grand Vizier, president of the divan, or council of ministers, was abolished (1878) by treaty of Berlin.

Vlaardingen, fishing-port of Netherlands, prov. S. Holland, near r. bk. of Maas, 6 m. by rail w. of Rotterdam, one of the headquarters of the Dutch herring fishery. Pop. (1900) 16,661.

Vladikavkaz, fort. tn., cap. of Terek prov., Russian Caucasus, 90 m. N. of Tiflis, and on river Terek, where it occupies a position of great strategic importance. Pop. (1897) 49,924.

Vladimir. (1.) Government, Central Russia, lying between Nijni-Novgorod on E. and Moscow on W. Area, 18,864 sq. m. The surface is a rolling plain, which belongs entirely to the Volga basin, mainly through the Oka and Klyazma. Lakes and marshes are numerous, the latter extensive. The chief mineral deposits are alabaster, limonite, and porcelain clay. The soil is for the most part sandy, stony, and clayey. The crops are rye, oats, millet, barley, potatoes, and flax. Fruit-culture is very flourishing. Industrially, Vladimir is the third government in Russia (coming after Moscow and St. Petersburg). The industries are concerned chiefly with the working of cotton, flax, cloth, silk, glass, pottery, crystal, metals (especially copper and iron), chemical products, timber, hides, icon painting, house painting, the manufacture of carts and carriages, gloves and stockings, beer and spirits, matches, and fur garments. Of the population, over 95 per cent. are Great Russian and Orthodox. Pop. (1897) 1,570,733. (2.) Town, Central Russia, cap. of Vladimir gov., 105 m. E.N.E. of Moscow; an archiepiscopal see (Vladimir-Suzdal); with a cathedral of the Assumption (built 1158, restored 1891); church of St. Demetrius (1197, restored 1835); church of the Nativity (1191, with tomb of St. Alexander Nevski); convent of the Nativity, since 1744 the archiepiscopal palace; citadel, or kremlin; and 'golden gate,' or arch of triumph (built 1158, restored under Catherine II.). It is a river port and has dye works, cotton mills, manufactories of candles, malt, and tobacco; also gardening and fruit raising, especially cherries. Founded in 1116 by Vladimir Monomakh, Vladimir became the capital of a line of grand princes, who replaced those of Kiev in power among Russian rulers. Pop. (1897) 32,029.

Vladivostok, fort. seapt. tn., cap. (since 1903) of the viceroyalty of E. Asia, Siberia, chief Russian naval port on Pacific, and a terminus of the Trans-siberian railway, is situated on E. shore of Amur Gulf. Its harbour of the Golden Horn is one of the most beautiful in the world. The climate is severe, the mean temperature for January being 6° F., while for August (the hottest month) it is 70°. Pop. (1897) 28,896. In the Russo-Japanese war it escaped attack by the Japanese, but suffered from naval mutiny and unrest in the Russian disturbances of 1905-6.

Vlissingen. See FLUSHING.

Vodena (anc. Edessa), tn., Monastir vilayet, Turkey in Europe, 40 m. E.S.E. of Monastir; has manufacture of tobacco. Here Philip II. of Macedon was assassinated. Pop. 14,000.

Vodka, Russian brandy, is a harsh, noxious, strong, fiery spirit, prepared mainly from the fermented wash of rye; but also obtained from barley, oats, and rye mixed.

Voetius, or VOET, GISEBERT (1588-1676), Dutch theologian, born at Heusden; became professor of theology at Utrecht (1634). He opposed the Arminian party at the Synod of Dort, and was an opponent of Descartes. His principal work is *Selectæ Disputationes Theologicæ* (5 vols. 1648).

Vogel, SIR JULIUS (1835-99), New Zealand statesman, was born in London, and was editor of the *Maryborough and Dunally Advertiser*, Australia; afterwards started the first daily paper in New Zealand, the *Otago Daily Times*. He became the head of the provincial government in 1866; colonial treasurer in 1869; postmaster-general of New Zealand, 1870. In 1871 he established the mail service between New Zealand and San Francisco. In 1872 he was again in office, and was premier in 1873. He was made K.C.M.G. in 1875. From 1876 to 1880 he was agent-general for New Zealand in London, and in 1884-7 he was head of a coalition ministry in New Zealand.

Voghera, tn., Pavia prov., Lombardy, N. Italy, 16 m. by rail S.S.W. of Pavia; has manufacture of silk. Its cathedral is 17th century. Pop. (1901) 20,442.

Vogler, GEORGE JOSEPH (1749-1814), German musical composer, was born at Würzburg; ordained priest at Rome (1773); founded schools of music at Mannheim, Stockholm, and Darmstadt; and numbered Meyerbeer and Weber among his pupils. His name is only known to many by Brown's poem, *Abt Vogler*. See *Life*, in German, by Schafhäütl (1887).

Vogt, CARL (1817-95), German biologist, born at Giessen; studied under Liebig and Valentin; and was the friend and collaborator of Agassiz and of Desor. Professor at Giessen (1847), he lost his chair through supporting the revolution (1848). Deputy for Giessen, he was expelled from Germany for his political views, and resided at Bern until called (1852) to the chair of comparative anatomy and zoology at Geneva. He was an active and thoroughgoing Darwinist. His works include *Physiologische Briefe* (1845); *Untersuchungen über Tierstaaten* (1851); *Bilder aus dem Tierleben* (1852); *Vorlesungen über den Menschen* (1864); and *Altes und Neues aus dem Tier- und Menschenleben* (1859). See B. Weber's *Professor Karl Vogt* (1899).

Vogüé, CHARLES JEAN MELCHIOR, MARQUIS DE (1829), French archaeologist and diplomatist, born in Paris; explored Palestine and Syria (1853-4), and became member of the Academy of Inscriptions (1868). In 1871 he was appointed ambassador at Constantinople, from which he was promoted to Madrid in 1875, but resigned in 1879. He was elected a member of the French Academy in 1901. His works include *Les Églises de la Terre Sainte* (1860), *Le Temple de Jérusalem* (1865), *Mémoires de Villars* (1889), and *Le Duc de Bourgogne et le Duc de Beauvilliers* (1900).

Vogüé, EUGÈNE MELCHIOR, VICOMTE DE (1848), French historian, cousin of above, born at Nice; contributed to the *Revue des Deux Mondes* and the *Journal des Débats*. He has been a member of the French Academy since 1888, and was deputy for Ardèche (1893-8). His chief work is *Le Roman Russe* (1886); but he has also written *Histoires Orientales* (1879), *Chez les Pharaons* (1879), *Histoire et Poésie* (1898), *Jean d'Agrève* (1898), *Les Morts qui Parlent* (1899), and *Le Maître de la Mer* (1903).

Voice and Voice Training. Voice is sound generated in the larynx. Generally speaking, the smaller the size of the larynx, the higher the pitch of the voice, and *vice versa*. From the age of six until nearing the period of puberty the larynx is approximately similar in size in both sexes; but in adults the larynx is about a third larger in males than it is in females, and the male voice is generally an octave lower in pitch than the female. Six species of singing voice are now recognized—*viz.* bass, baritone, tenor (male); contralto, mezzo-soprano, and soprano (female). The classification of voices is determined by the nature of their timbre, and not by their extent of compass. In

each species the average compass ranges from a little under to a little over two octaves, a compass of three octaves being exceptional. The lowest musical sound known to be capable of production by the human voice is the note G below the bass staff, the highest is B in *altissimo*. A series of notes of approximately similar quality is termed a 'register.' At the junction of certain registers an indefinite number of notes may be produced either as higher notes of the lower, or as lower notes of the higher register, and the change of register should always be made upon one of these 'optional' tones. When the change of register is only barely perceptible, the registers are said to be perfectly 'united,' or 'blended.' The familiar terms 'chest-voice' and 'head-voice' date from the period when it was not known that all voice originates in the larynx. Apart from the influence of 'registers,' the sounds produced by an individual voice vary in volume and quality according to the strength of the air current which causes the vocal ligaments to vibrate, and the extent to which the tone is reinforced or modified in or by the resonating chambers of the chest, throat, mouth, and nose.

The first essential to correct voice production is proper management of the breath. The method of breathing taught in the early Italian schools of singing was that now known as 'inferior costal,' in which the abdomen is drawn slightly inwards, and the chest is raised during inspiration. In France and Britain at the present day, the greater number of celebrated vocalists also use inferior costal and diaphragmatic respiration, and many keep the chest in a fixed high position both in inspiration and in expiration. All voice should be produced with the least possible expenditure of breath. Inspiration should be made through the nose, unless for quick 'half-breaths,' and respiration should be so regulated that the lungs neither become overcrowded with air nor exhausted to a degree which does not leave a conscious reserve of breath at the conclusion of a sustained tone.

The voice is said to be correctly 'placed' when it is directed towards the frontal portion of the roof of the mouth, and a sense of strong vibration is felt in the bridge of the nose. Each tone, whether loud or soft, must be 'attacked' with decision, but not in an 'explosive' manner, and any tendency to 'scoop' up to the notes must be instantly checked. See Morell Mackenzie's *The Hygiene of the Vocal Organs* (5th ed. 1888); Brown and

Behnke's *Voice, Song, and Speech* (15th ed. 1893); Curtis's *Voice Building and Tone Placing* (2nd ed. 1900); Sims Reeves's *The Art of Singing* (1900); Ellis's *Speech in Song* (1878); Newland's *Voice Production* (1906); Lunn's *Philosophy of Voice* (10th ed. 1906).

Void and Voidable. A transaction is void if it has no legal effect—*e.g.* a contract to commit a crime. It is voidable if it can be rendered void by putting the law in motion: for example, a contract is voidable on the ground of misrepresentation, though a party aggrieved may elect to abide by and sue on it.

Voiron, tn., dep. Isère, France, 14 m. N.N.W. of Grenoble; has manufactures of cloth, silk, and paper. Pop. (1901) 12,116.

Voiture, VINCENT (1598-1648), French writer of *vers de société* and of letters—tittle-tattle of the Hôtel Rambouillet—where he was introduced in 1625. Born at Amiens, he won favour with Gaston d'Orléans by tactful flattery in verse (1614), and with Richelieu in prose (1636); was made *maître d'hôtel* (1638) by Louis XIII.; and pensioned by D'Avaux (1642), Anne of Austria (1643), and Mazarin (1645). By turns literary *précieux*, wit, courtier, diplomatist, duellist, gambler, squire of dames, he was an original member of the Academy. His works were first published in 1650. Later editions: *Poems*, by Ubicini (1855), and Roux (1856); *Letters*, by Uzanne (1880). See also Sainte-Beuve's *Causeries du Lundi*.

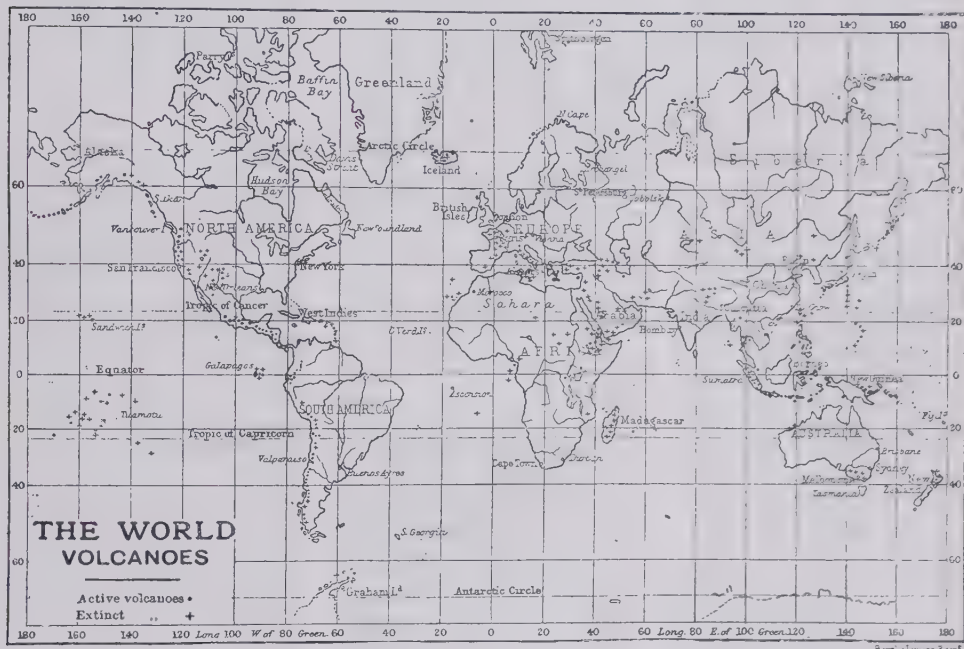
Volapük, an artificial language, invented in 1879 by Schleyer of Constance, Baden, for international use. He taught it successfully in Paris in 1886, and in 1887 it was advocated for diplomatic and scientific purposes by the Philological Society of London. The roots are chiefly borrowed from Romanic, Germanic, and especially the English languages, shortened. The orthography is strictly phonetic. The leading peculiarities of Volapük are: (1) The alphabet consists of twenty-seven letters—eight vowels and nineteen consonants; (2) each letter has but one sound; (3) the consonants are sounded as in English, except *c* and *j*—*g* is always hard, and *h* is an aspirate; (4) the accent is invariably on the last syllable; (5) there is one conjugation, and there are no irregular verbs; (6) all word-forms and inflections are regular; (7) adjectives, verbs, and adverbs are regularly formed from substantives; (8) *v* becomes *r*, and *l* is substituted for *r*; (9) words are as far as possible reduced to one syllable; (10) nouns have one declension and four cases; (11) adjectives are formed by adding *ik* to the substantive, and adverbs

by adding *o* to the adjective, as *fam* (glory), *famik* (gloriously), and *famiko* (gloriously); (12) *oi* prefixed to a word indicates the feminine gender. In 1888 C. E. Sprague published *The International Language: Hand-book of Volapük*.

Volaterræ. See VOLTERRÆ. Volcanoes are typically mountains of conical form, which discharge steam and other gases, ashes, and lava through a deep cup-shaped orifice or crater, situated near the summit. Vesuvius, near Naples, is the best known example. During violent eruptions the material which gathers in the crater is projected, and the depth of the crater is said to

phirous gases and volcanic ashes and dust, are emitted. Greater activity is marked by the ascent of large gray steam clouds, which ascend vertically for several thousand feet, then spread out and flatten like the top of a pine tree. Larger blocks of lava, known as bombs, are ejected with the steam. After a longer or shorter duration of this phase the lava rises in the crater and wells out through some opening in its sides. The lavas are red hot at first, but rapidly cool, and then have a rough, slaggy crust, under which the liquid interior mass continues to advance. Great quantities of water are dissolved in the lavas, and enormous steam clouds mark their progress.

however, we must pass to extra-European countries, such as Java, Japan, New Zealand, the West Indies, and the Sandwich Islands. Two main types of great eruptions may be distinguished—the explosive and the effusive. In the former the activity is very violent, but brief and intermittent. Usually these volcanoes rest for many years, then have an eruption which lasts a few weeks or a few days, and sink again into quiescence. Krakatoa is a good instance. It is an island in the Sunda Straits, between Java and Sumatra. In 1883, after two centuries of repose, it again became active. On the 26th August a gigantic explosion took place.



reach occasionally 2,000 ft. A small central cone is often built up within the crater, and around it the steam and ashes are emitted. To the north of the crater rises the broken cone of Monte Somma, the remains of a larger volcano. The existing Vesuvius has been gradually piled up on the depressed edges of the great crater bowl of Monte Somma. In the Phlegrean Fields near Naples are many small volcanoes, extinct or in a quiescent state, and discharging only carbon dioxide and sulphurous gases. This is known as the solfataric condition, from one of these minor cones (the Solfatara). At Vesuvius, during normal conditions, only small quantities of steam, mixed with sul-

Vesuvius has been known as an active volcano since the year 79, when the great eruption took place in which the elder Pliny perished, and Pompeii, Herculaneum, and Stabiae were overwhelmed. Since then it has continued active, though with many periods of repose, sometimes lasting for several hundred years. The Lipari Is., off the N.E. of Sicily, contain many volcanoes. Of these Vulcano has had several eruptions in recent years, and Stromboli is in a state of almost constant activity. Many islands have begun as submarine volcanoes, and have gradually been built up till they overtopped the sea surface.

For the more powerful manifestations of volcanic activity,

One half of the adjacent island of Rakata was blown away, and the depth of the great submerged crater, on the edge of which Rakata stood, was increased to nearly 200 fathoms. The ashes were projected into the air to such a height that the finest of them were carried all over the world, and for months afterwards occasional brilliant sunset effects in all latitudes. Great sea-waves, from 70 to 100 ft. high, started from the crater and devastated the surrounding coasts, drowning many thousands of people. The waves crossed the oceans in all directions, and were traced by their effects on the tide gauges even in California and the Isthmus of Panama. Similar waves

were produced in the atmosphere, and circled round the whole globe.

In 1886 a great explosive eruption suddenly took place in the North Island of New Zealand in the hot-springs districts around Lake Tarawera. The white and pink terraces of Rotomahana were destroyed, and a fissure eleven miles long was opened, out of which steam and ashes proceeded. The eruption lasted only a few hours. The most deadly outbursts of this type are those of the West Indian volcanoes. Pelée in Martinique and La Soufrière in St. Vincent. In 1902, after a brief preliminary phase, they burst into activity, and discharged not only clouds of steam and ashes, but also black clouds or burning clouds, composed of superheated steam and incandescent dust. These rolled like torrents of water down the slopes of the mountains. About 2,000 people perished in St. Vincent, while in Martinique, the city of St. Pierre, with nearly 40,000 of its inhabitants, was destroyed in a few minutes.

The second type of volcanic activity, the effusive, is characterized by the emission of floods of lava, which deluge large tracts of country. The best examples are found in the Sandwich Islands, and are great cones rising to 12,000 ft. above sea-level. They are composed principally of black basaltic lava flows, while beds of ashes, indicating explosive volcanic action, are few or wanting. The principal crater is Kilauea, a great flat-bottomed pit 2 or 3 m. across, with vertical sides, rising from 700 to 900 ft. above the interior floor of lava. In the centre of this crater there is 'a lake of fire.' Certain also of the Icelandic volcanoes have discharged great lava-flows. In 1783 Skaptar Jökul emitted a flood of basalt, which has been estimated to have a mass equal to that of Mont Blanc. In one direction it extended for 50 m., and its breadth in places was from 12 to 15 m., its depth in some parts 800 ft. Enormous sheets of basalt belonging to the same system of volcanic centres are found in the north of Ireland (Giant's Causeway) and in the Inner Hebrides (Skye and Mull). Other fields of basalt of great extent occur in the Deccan (India) and on the Snake River (Idaho) and Columbia River (Washington).

The geographical distribution of active volcanoes is a subject of great interest. By far the greater number stand near the sea; this is probably due to the fact that many coast-lines are determined by earth-folds. A great ring of volcanoes encircles the Pacific. It includes the volcanoes of Kamchatka, the Kuriles, Japan.

the Liu-Kiu Is., Philippines, Java, Sumatra, New Zealand, and the Antarctic (Erebus and Terror). It is continued in Patagonia and the Andes, Central America, Mexico, Western N. America (Cascade Mts., where there are many volcanoes, recently extinct), and Alaska. Branches of this great chain are found in the W. Indies, and in Sumatra and the islands of the Indian Ocean. Along the centre of the Atlantic there lies a ridge, capped with volcanic islets—e.g. Tristan d'Acunha, St. Helena, Ascension, the Cameroons, Cape Verde Is., Canary Is., and Azores. Nearer the Arctic are Iceland and Jan Mayen. In the Indian Ocean the principal volcanoes are those of Madagascar, Mauritius, Réunion, St. Paul I. A number of cones occur in Africa, including Kilima-Njaro and Kenia. They lie along a set of fissures, which pass northwards into the Red Sea, and thence into Syria and Palestine. Similarly the Alpine system of recent mountain folding, with its extensions into the Apennines, the Balkans, Carpathians, Caucasus, and Himalaya are accompanied in many districts by volcanoes, active or recently extinct. These include the Italian volcanoes already mentioned, the extinct cones of S. Spain, the Auvergne, and the Eifel, Hungary, and Asia Minor. Ararat, Demavend in Persia, and certain volcanoes in Central Asia continue this series to the East.

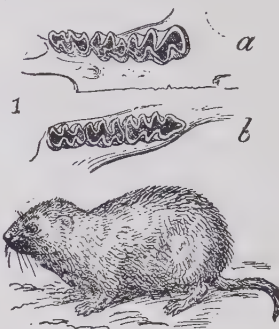
It is clear that at depths of a few miles in the earth's crust, especially in regions which are undergoing or have recently undergone the process of folding, great masses of rock exist at a very high temperature and under great pressure. They contain much water vapour, occluded, but ready to expand when the pressure is relieved. The temperature is not less than 1,200° c., and may be considerably above this. Escape tends to take place along lines of weakness. In Britain there is evidence of repeated volcanic activity in bygone times.

The best general works on the subject are those by Scrope, Daubeny, Judd, Bonney, and Hull. Good illustrations have been published by Dr. Tempest Anderson. Sir A. Geikie has described the *Ancient Volcanoes of Britain* (2 vols. 1897), and in his *Text-book of Geology* (4th ed. 1903) an excellent general account of the whole subject is given.

Volchansk, tn., Kharkov gov., S. Russia, 50 m. N.E. of Kharkov city. Pop. (1897) 11,322.

Volci, or **VULCI**, an ancient Etruscan city, whose inhabitants were defeated by the Romans in 280 B.C. Its necropolis was dis-

covered in 1828, and contained a large number of painted vases, besides objects in bronze and gold. The site of the city is 55 m. N.W. of Rome. Inscriptions and coins show that it existed until after 300 A.D.



Water Vole (*A. amphibius*).

1. Molars: a, upper, b, lower jaw.

Vole (*Arvicola*), a large genus of rodents. Voles may be distinguished from rats and mice by the fact that the tail is either short or only moderately long, the body is stouter, the muzzle more obtuse, the limbs shorter, the eyes and ears smaller, and by the structure of the teeth. In the voles the cheek teeth (molars) consist of two rows of triangular prisms, arranged alternately; whereas in the rats and mice these teeth bear a number of tubercles, arranged in three longitudinal rows. The short-tailed field vole, popularly called the field mouse (*A. agrestis*), is abundant everywhere, and periodically occurs in vast and very destructive swarms. Such a swarm occurred in the southern counties of Scotland in 1892. A field vole breeds three or four times a year, and produces from four to six young at a time. In gardens the vole is very destructive, being the 'mouse' of which many gardeners complain. It is largely nocturnal, and makes extensive runs beneath the grass of meadows. In addition to these, burrows are constructed. Another British vole is *A. glareolus*, the bank vole, which is local in its distribution, and resembles the field vole, except that it is darker in colour and has a longer tail. Very different in habit is the water vole (*A. amphibius*), often called a water rat, which is about the same size as the brown rat. The feet are not webbed, and are naked beneath, while the colour is usually reddish brown. The water vole lives in burrows in the banks of streams. The diet consists chiefly of water plants, but field crops are also attacked.

Volga, riv. of Russia, the longest in Europe, tributary of the Caspian Sea, rises on the Valdai plateau, in gov. Tver, at 790 ft. above sea-level; flows s.e. to Rjev, then n.e. (by Tver and Uglich) to above Rybinsk; then s.e. to Yaroslavl, e.n.e. to Kostroma, s.e. to Nijni-Novgorod, e. to Kazan, s. to Simbirsk, s.e. to Samara, s.s.w. by Saratov to Tsaritsyn, and finally s.e. to Astrakhan. Total length, 2,310 m.; drainage area, 585,000 sq. m. It possesses only a very slight and gradual fall, and thus is excellently adapted for navigation. In spring floods the waters (e.g. at Nijni-Novgorod and Saratov) are from 10 to 13 m. across. The chief tributaries are the Mologa, Kostroma, Unsha, Oka, Vetluga, Kama, Sura, Samara, and Irghis, the Oka and Kama being themselves among the great rivers of Europe. From Nijni-Novgorod to Tsaritsyn the right bank is high and scarped, rising, between Simbirsk and Syzran, to about 1,100 ft.; the left bank is low and flat. The river becomes navigable for small vessels at Rjev, for large vessels at Tver; but the largest steamers usually stop at Rybinsk, or in later summer at Nijni-Novgorod. The river is ice-free for from 193 to 260 days. The chief Volga ports are Astrakhan, Nijni-Novgorod, Samara, Tsaritsyn, Balakovo (near Volsk), Saratov, Kazan, Rybinsk, Simbirsk, and Yaroslavl.

Volhynia, gov., W. Russia, bounded e. and s.e. by Kiev, and w. by Galicia and Poland. Area, 27,743 sq. m.; pop. (1897) 2,997,902. In the s. it is broken up by outliers of the Carpathians, but in the n. and n.w. is intruded upon by the Polyesie, or marshes of the Pripiet region. In the former district occur heights of 1,200 ft. between the S. Bug and Dnieper basins, and of over 1,300 ft. at Kremenets. The whole government belongs to the basins of the Dnieper and Bug; the latter forms the w. frontier for about 100 m. Deposits of potters' clay, kaolin, iron ore, coal, lignite, graphite, jasper, and amber are found; in the s. are considerable tracts of black earth soil. Industries are principally connected with timber trade and woodwork, distilling, tanning, brick, sugar, pitch, glass, porcelain, cloth, and candle making, machinery, and iron-working. Little Russians comprise three-fourths of the people.

Volition. See WILL.

Volsk. See VOLSK.

Volkovsky, dist. tn., Grodno gov., W. Russia, 43 m. s.e. of Grodno city; with breweries, tanneries, dye works, manufacture of tobacco, matches, and candles. Pop. (1897) 10,584.

Volley Firing. In volley firing the men fire simultaneously by word of command from their commander. The regulations prescribe that volley firing should always be the rule in the earlier stages of attack and defence, and until decisive ranges are reached. Exceptionally, when comparatively large bodies of troops show themselves, offering a target for a limited time only, volley firing may be exchanged for independent, even at long ranges, as also may happen under the pressure of some immediate danger. The

of a party organ at Dresden (1877), more than once imprisoned, and finally expelled; acted as editor of the *Social Demokrat* at Zürich (1879-82). Elected to the Reichstag (1881), he was also member of the Saxon Diet (1883-89) and of the Bavarian Diet (1893). He belongs to the more moderate wing of his party.

Vollon, ANTOINE (1833-1906), French painter, was born at Lyons, and acquired a reputation as a painter of landscapes, portraits, flowers, and fruit. His *Coin de Halle* is in the Luxem-



Basin of the Volga.

experience of the S. African war of 1899-1902 seems to show that the superiority of volley firing over independent fire has been overrated. Its effect, like that of artillery, is rather moral than practical.

Vollmar, GEORG HEINRICH VON (1850), German socialist, born at Munich; served in the campaign of 1866, and afterwards as a papal volunteer, and in the Franco-German war (1870-1), when he was wounded and crippled at Blois. Since then he has devoted himself to politics as a social democrat. He was editor

bourg at Paris, and ranks as a masterpiece, while his *Portrait d'un Pêcheur* (1868) and *Après le Bal* (1869) both gained medals.

Volney, CONSTANTIN FRANÇOIS CHASSEBŒUF, COMTE DE (1757-1820), French writer, was born at Craon in Mayenne. His first book was *Voyage en Syrie et en Egypte* (1787). Elected to the Constituent Assembly (1789), he suffered imprisonment, but his life was saved by the fall of Robespierre. He is best known as author of *Les Ruines, ou Méditations sur les Révolutions des Empires* (1791). From 1795 to

1798 he was in America. His *Œuvres Complètes* appeared in 8 vols. (new ed. 1836). See a monograph by Berger (1832), and Sainte-Beuve's *Causeries du Lundi*.

Volo, seapt. tn., Larissa prov., Greece, on E. coast of Thessaly, at head of Gulf of Volo, 33 m. S.E. of Larissa. It is an archiepiscopal see. Pop. (1896) 16,232.

Vologda, (r.) Government, N. Russia, bounded N. by Archangel, and E. by the Ural range. Area, 155,498 sq. m. Pop. (1897) 1,365,587. Except in the N.E. and S.S.W., the surface is flat, thickly covered by forests, and cut up by innumerable rivers, mostly belonging to the basin of the N. Dvina, the rest to that of the Petchora, Volga, and Mezen. But in the N.E. Vologda contains the highest summits of the Urals (e.g. Tölpos-Iss, 5,440 ft.). Lakes are numerous but small, and a large proportion of the government is covered with marshes. The mineral wealth is considerable, especially in salt and iron; millstones, grindstones, and naphtha are also yielded. The industries are mostly concerned with timber. Salt deposits are worked, iron and earthenware objects manufactured, and jewellery and filigree work are made. There are also cloth mills, oil works, candle, flax, paper, and bristle manufactories. Nine-tenths of the people are Russians; the remainder belong to the Zyryanian and other Finnish stocks. (2.) Town, N. Russia, cap. of Vologda gov., 108 m. N. of Yaroslavl, and on the Vologda, is a river port, and possesses some ancient churches, including the cathedral of St. Sophia (1568). Pop. (1897) 27,822.

Volsci, ancient Italian people, who inhabited the eastern half of Latium. During the 5th and 4th centuries B.C. they were constantly at war with Rome, but by 304 B.C. had become Roman citizens. Their chief towns were Antium, Satrium, Privernum, Arpinum, and Fregellæ. Racially they were akin to the Umbrians and Oscans.

Volsk, tn., gov. of Saratov, Russia, on r. bk. of Volga, 63 m. N.E. of Saratov; has iron works, tanneries, and flour mills. Pop. (1897) 27,572.

Volsunga Saga, in old Norse literature, the mythical history of the Volsungs and Nibelungs. Its central hero is Sigurd the Volsung (the Siegfried of the *Nibelungenlied*). It forms part of the *Elder Edda*. See W. Morris's *Story of Sigurd the Volsung* (1898).

Volt, the practical electric unit of electro-motive force (E.M.F.), equalling 10^8 C.G.S. electro-magnetic units of electro-motive force. The standard of E.M.F. is that of the Board of Trade

Clark cell, which gives at 15° C. 1.434 volts. Electro-motive force is equivalent to difference of potential between two points; it is what sustains a current in a closed circuit. It is also spoken of as electric pressure on analogy with water pressure; also as voltage when the difference of pressure is measured in volts. See ELECTRICITY, CURRENT.

Volta, ALESSANDRO, COUNT (1745-1827), Italian physicist, born at Como. In 1777 he travelled through Switzerland, making the acquaintance of Haller, Voltaire, and Saussure, and in 1779 was elected professor in Pavia University. In 1782 he took a long journey through France, Germany, Holland, and England (where he met Priestley). In 1815 the Emperor Francis appointed him director of the philosophical faculty of Padua, from which he retired in 1819. Volta invented (1775) the electrophore and an electrical condenser (1782). He also constructed the earliest absolute electrometer and the electric pile, the latter of which was first described in a letter to the Royal Society of London, March 20, 1800. His *Opere Complete* were published in 1816. See Bianchi and Mochetti's *Vita di Volta* (1829-32), and Volta's *Alessandro Volta* (1875).

Voltaic Cell. See CELL, VOLTAIC.

Voltaire, FRANÇOIS MARIE AROUET DE (1694-1778), French writer, born at Paris, son of François Arouet, an official of one of the high courts. He was educated at the Jesuit Seminary of the Collège Louis-le-Grand in Paris. At this time Ninon de L'Enclos gave him lessons in social deportment, and left him a legacy; and he was introduced to the Société du Temple, in which the best intellectual society of Paris was to be found side by side with the most reckless dissipation. Soon a stream of satires, epigrams, odes, and epistles began to pour from Voltaire's pen, and the larger portion of *Œdipe* was then written. In 1712 he was an unsuccessful competitor for the prize offered by the French Academy for the best ode on the subject of the restoration of the choir of Notre Dame. After some time spent in the study of the law, on the death of Louis XIV. he wrote a foolish satire on the regent (the Duc d'Orléans), for which he was imprisoned (1717) in the Bastille. On his release his play *Œdipe* was produced at the Théâtre Français, and proved a brilliant success. He then took the name of Voltaire. In February 1720 his second play, *Artémire*, was produced, achieving, however, only a *succès d'estime*. In 1724 his play of *Mariamne* was pro-

duced, with the young actress Adrienne Lecouvreur in the title rôle; but shortly after another quarrel again brought him inside the Bastille. Shortly before this his *La Henriade*, a noble poem on Henry IV., had seen the light. On being released from the Bastille Voltaire went to England (1726-9), and there through Bolingbroke formed friendships with the leading English statesmen and writers, and studied the political and religious conditions of the country. After returning to Paris he devoted himself to literature and to commercial speculations, from which he realized a large fortune. But his indignation over the treatment meted out by the clergy to the remains of Adrienne Lecouvreur, and his contempt for court sycophancy and intrigue, led him to speak with satiric bitterness of the powers that then were in his *Lettres Philosophiques* (1733) and *Épître à Uranie*. With a friend, Madame du Châtelet, and her husband he retired to Cirey, a château on the borders of Champagne and Lorraine, where from 1734 to 1749 he resided, immersed in study and literary labours. During this period some of his best work was executed—the three plays, *Alzire*, *Mahomet*, *Mérope*; his *English Letters*; his satiric poem *La Pucelle*; and his philosophical works, *The Treatise on Metaphysics* and *Essai sur les Mœurs et l'Esprit des Nations*, which, with all its defects, still takes rank as one of his finest treatises; also *Zadig* and his Eastern romances. In 1740 Frederick the Great of Prussia invited Voltaire to visit him. Though this did not come off until a year or two later, an intimacy was established between the monarch and the man of letters, and the latter saw a treatise by Frederick, entitled *Anti-Machiavel*, through the press. In 1743 Voltaire was sent on a secret mission to Frederick. For this service, through the influence of Louis XV., he was elected a member of the French Academy (1746), and appointed historiographer-royal. After the death of Madame du Châtelet (1749) Voltaire was induced to proceed to Paris, then to visit Frederick of Prussia at Berlin (1751). He spent three years in Prussia, having apartments assigned to him at Potsdam, a pension of 20,000 francs, a chamberlain's gold key, and a cross of merit, his only duty being to correct his majesty's writings. Frederick and Voltaire, however, could never agree for any length of time, and at last they agreed to part, professedly for a time, but Voltaire determined never to return. While there he published his *Siccle de Louis Quatorze*.

After leading an unsettled and migratory life for some years, Voltaire finally settled down near Geneva at Ferney, where he spent the last twenty years of his life. *Candide*, *Siècle de Louis Quinze*, *Dictionnaire Philosophique*, *A Treatise on Toleration*, and his last tragedy, *Irène*, all fall within this period. His rancour against the church increased with years, and from his retirement he discharged a ceaseless succession of satiric shafts at the clergy and their dupes. In the Calas affair, as the champion of the weak and the downtrodden, he was able to clear the memory of a dead man from a foul aspersion cast on it by the priests. Voltaire died whilst on a visit to Paris. The curé of St. Sulpice refused to inter the body, so the remains had to be hurriedly buried in the Abbey of Scellières. In 1791 the body was transferred to the Panthéon, but during the excitement of the 'hundred days' it was removed, and thereafter all trace of it was lost. Voltaire as a poet fails to touch the heart, nor does he ever appeal to the deeper sympathies of human nature. His dramas are ill-constructed, but they abound in apt and clever character sketches, and reveal a great fund of wit. As a satirist Voltaire is one of the greatest the world has seen. The best edition of his *Œuvres* is that by Moland in 32 vols. The best *Lives* are those by Desnoiresterres (8 vols. 1887), James Parton (1881), and Tallentyre (2 vols. 1903). See also Morley's *Voltaire* (1872; later ed. 1886); also biographies by Hamley (*Foreign Classics for English Readers*, 1877) and by Espinasse (*Great Writers Series*, 1892).

Voltmeter, the name given to an instrument which measures current strength by the amount of a given electrolyte decomposed in a given time. See ELECTRICITY, CURRENT.

Volterra (anc. *Volaterræ*), tn., Pisa prov., Italy, 32 m. S.E. of Pisa; has manufactures of alabaster goods, iron, and salt. The town possesses a very fine Romanesque cathedral, consecrated in 1120. The national museum, in the Tagassi palace, contains an interesting Etruscan collection. Pop. (1901) 14,207.

Volterra, DANIELE DA (c. 1509-66), Italian artist, whose real name was Daniele Ricciarelli, born at Volterra; became the assistant of Michael Angelo, painting some of the great Florentine's designs, especially *David* and *Goliath* (Louvre). Latterly he excelled as a sculptor. His masterpiece in painting is *The Descent from the Cross*, a fresco in the church of the Trinità dei Monti at Rome.

Voltmeter, an instrument for measuring electro-motive force or pressure in volts. The instrument is connected by wires to the two points between which the pressure is to be ascertained (e.g. the two terminals of a dynamo or battery), and a

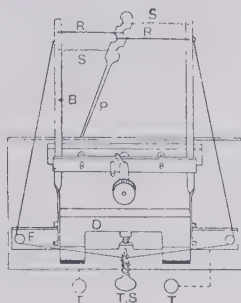


FIG. 1.—Cardew Voltmeter.

R, Rigid wire; S, light springs; B, brass block; P, spring bow or levers; D, permanent magnet; T, terminals; TS, tension screw.

pointer, actuated by the mechanism, moves over a graduated scale. There are four types in general use, of which one, the electrostatic, is the only direct pressure indicator. Two insulated pieces of metal become oppositely electrified by the electric force between them, and hence attract each other, the force of attraction giving a measure of the E.M.F. (See ELECTROMETER.) These can be used equally well for continuous and for alternating pressures, and are specially suitable for high pres-

really current-measuring instruments. To economize current the resistance is made large, and where it is inconvenient to give a sufficiently large resistance to the instrument proper an extra resistance of fine wire is added. This can be made of a special alloy, such as manganese, the resistance of which does not appreciably alter with temperature, and thus changes in the temperature of any copper wires used affect only a small part of the total resistance, and the latter remains substantially constant. Three types are in use:—

1. **Hot Wire Instruments** (Fig. 1).—In these a small current passes through a fine stretched wire of high resistance, and the heat produced causes it to increase in length. Magnifying levers are moved by this extension, and the movement is finally shown by a pointer over a scale. These instruments can be used either for continuous or for alternating currents, since both alike cause heating. They are very convenient for low pressures, but as a certain minimum current is required to heat the wires, they are inconvenient for high pressures, except by the use of additional apparatus.

2. **Moving Coil Type** (Fig. 2).—In these a coil of fine wire is pivoted on jewelled centres, and placed between the poles of a powerful horse-shoe magnet, with curved pole pieces. Inside of the coil is a cylinder of soft iron to concentrate the magnetism, and the coil rotates in the space between the pole faces and the cylindrical core. Current is led into the coil and out again by spiral metal springs attached at one end to the frame, and these also serve to bring the coil back to the zero mark. When current flows through the coil, magnetic action causes the wires to traverse the magnetic field in the gap, and the coil rotates through an angle proportional to the current, and therefore proportional to the pressure. The instruments are very sensitive and accurate, and the magnet, if carefully made, retains its magnetism practically unchanged for years. They are used only for continuous currents.

3. **Soft Iron Type** (Fig. 3).—These are similar to the ammeters of this kind, but are not accurate instruments. As the coil requires very many turns of fine wire, its resistance is high, and the copper resistance is therefore a considerable portion of the whole, thus producing an appreciable error when the instrument becomes heated by the current. Also the residual magnetism of the iron produces considerable errors, and they have not the accuracy usually required for the

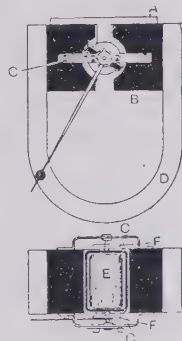


FIG. 2.—Moving Coil Voltmeter.

A, Brass; B, soft iron pole pieces; C, moving coil; D, permanent magnet; E, iron core; F, hair springs (phosphor bronze).

sures, as they consume no current. They are free from temperature errors, and are quite independent of magnetic influence. The other types depend on Ohm's law, that with a given resistance the current is proportional to the pressure, and are

regulation of electrical pressure. Owing to the self-induction of the coil there are errors produced when used for alternating currents, while they are inferior to the moving coil type for continuous currents. They are also easily influenced by the magnetic action of currents or of dynamos in the neighbourhood.

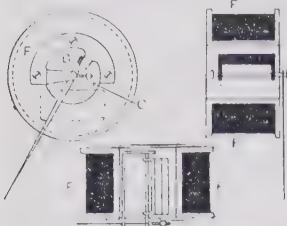


FIG. 3.—Soft Iron Voltmeter.
b, Soft iron weight; c, balance; r, fine copper wire.

Instruments of the dynamometer pattern, using the attraction or repulsion between two coils, can also be used as voltmeters by making the coils of fine wire; but they are expensive.

Voltri, *tn.*, Genoa prov., Liguria, Italy, on Gulf of Genoa, 9 m. by rail n.w. of Genoa; has manufactures of paper, cotton and woollen goods, and iron. There is also shipbuilding. The French under Masséna were defeated by the Austrians in 1800. Pop. (1901) 14,815.

Volumenometer. See SPECIFIC GRAVITY.

Volumetric Analysis. See ANALYSIS.

Voluntarism, the theory which maintains that churches and clergymen should be supported by voluntary contributions, and not depend upon state aid, and this in the interest of religious liberty and equality. The Liberation Society was formed to advocate these principles through its organ the *Liberator*, and is opposed by the Church Committee for Church Defence.

Volunteers. With the establishment of Napoleon's camp at Boulogne there commenced a long period, from 1803 to 1815, of imminent danger of invasion, and a force of volunteers, stated in the estimates of 1803-4 to amount to 453,000 men, was raised for local service. After the peace of 1814 the infantry volunteers fell almost entirely into abeyance; but the successes of the French in N. Italy in 1859 gave, in England, fresh impetus to the volunteer movement, and the force speedily rose from 70,000 to 180,000 men. The present volunteer force consists of corps raised voluntarily. The men are enrolled in, and the officers appointed to, the corps, and its

commanding officer has power to dismiss a man from it. Subscriptions and property are vested in the commanding officer. As many corps were too small to form a regiment, provision was made by the Act of 1863 for the formation of administrative regiments. These have now disappeared, and the smaller corps form companies in the battalions in which the force is organized.

The infantry of the volunteer force are formed in battalions, and attached to the territorial regiment in the district in which they are located. The regimental training is carried out under the immediate instruction of the permanent staff, consisting of an adjutant and a number of sergeant-instructors belonging to the regular forces. An inspection of every battalion is annually undertaken by the colonel commanding the regimental district to which it belongs. Daily allowances are granted to those who attend brigade camps for a sufficient time. Liberal allowances are also given to corps which can ensure the attendance of a large proportion of their men for periods of fourteen days at a time.

The volunteer artillery consists of 68 corps, with a permanent staff similar to that of the infantry. For purposes of command and inspection the artillery are under the order of the officer commanding the militia and volunteer artillery district to which they belong, while they are as a body attached to one of the six groups into which the garrison artillery is divided. A portion of the force is trained as garrison artillery, while the remainder are formed into batteries of position armed with heavy field guns, and horsed by local arrangement.

The volunteer engineers comprise 23 corps of sappers, 7 submarine mining divisions, a corps of electrical engineers, a motor, and a railway staff corps. A volunteer medical service has been organized; but the force has at present no proper army service corps, though there are 37 detached companies in existence.

The only corps of volunteers that possesses a history is the Honourable Artillery Company, which derives its origin from a voluntary association to which a charter of incorporation was granted in 1537. It consists of two horse artillery batteries and a battalion of infantry, and takes precedence of all other volunteer corps. It does not, however, come under the volunteer regulations.

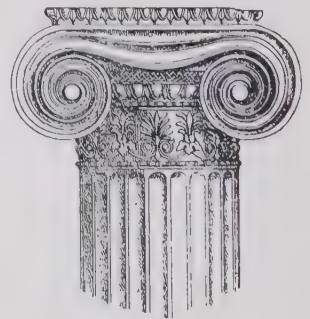
The strength of the volunteer force for the year 1905-6 was 340,000 men, of whom nearly 242,000 were efficient.

In the case of actual or apprehended invasion of the United

Kingdom the volunteers may be called out for active service, and are bound to serve until released by proclamation. Whenever an order for the embodiment of the militia is in force, any volunteer or body of volunteers may offer themselves for active military service. Under ordinary circumstances the volunteer force is not under military law, but the individuals in it are bound by volunteer regulations. Military law is, however, applicable to volunteers on active military service, or when being trained or exercised with regulars or militia.

The funds from which the expenditure for uniforms and equipment of the men, rent and maintenance of drill grounds, storehouses, and offices, is defrayed are either wholly or partially derived from yearly grants earned by efficient service. The government supplies arms and ammunition only; everything else must be defrayed from the grants and allowances earned, supplemented if necessary by outside financial assistance. In May 1906 the War Office appointed an inter-departmental committee to inquire into the organization and administration of the force. See R. P. Berrey's *History of the Formation and Development of the Volunteer Infantry* (1904).

NAVAL VOLUNTEERS.—A reserve force known as the Royal Naval Artillery Volunteers was raised in 1873; it was made up of brigades, each consisting of four or more batteries of sixty or eighty men. The officers were commissioned by the Admiralty, and ranked with, but after, naval officers and royal naval reserve officers. The stationary drillships of the naval reserve were assigned for the instruction of the force, and provision was made for a cruise in a gunboat once a year. The force was disbanded in 1892, but was revived in 1904.

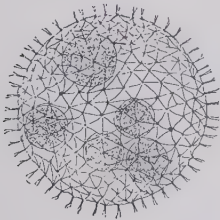


Volute.

Volute, in architecture, the scroll or spiral ornament forming the characteristic feature of the

Ionic capital. The original Greek volute—e.g. on the Erechtheum at Athens—is on the front and back only of the capital, which involves a difficulty in a peripteral building. There is an example of a Greek angle volute in the temple at Bassæ; but it is only in Roman work that we see this idea perfected.

Volvox, a colonial flagellate protozoon which is so plantlike in its characters that it is by botanists usually included in the Algae. Volvox is a hollow ball of cells, the cells being embedded in a membranous envelope. The method of nutrition is entirely plantlike. Two types of reproduction occur. Certain cells of the colony, by repeated division, give rise to small new colonies. These minute colonies escape into the water by the rupture of the envelope of the parent colony, and there grow into colonies like the parent. This mode of reproduction goes on throughout the earlier part of the summer; but later a new type of colony appears, in which there are a large number of specialized reproductive cells, which are without flagella, and are of large size. Certain of these become ova, while others give rise to a great number of active minute cells comparable to spermatozoa. These cells are set free, and proceed to fertilize the stationary ova. As a result zygotes are formed, which have a very thick cell wall of cellulose, and remain dormant through the winter, giving rise to new colonies in spring. The species of Volvox are all found in fresh water; a common form is *V. globator*.



Volvox globator.

Volvulus, a condition of the intestine in which a part is twisted or kinked, so that the passage is closed. It is thought to be caused by accumulation of gas, or by chronic constipation. Symptoms are acute pain in the abdomen, often distinctly located, with constipation and vomiting, the onset being rapid.

Vomiting, the forcible expulsion of the contents of the stomach through the œsophagus. The act is generally preceded by nausea and a rush of saliva. Vomiting may be excited by

stimulation of (1) the vomiting centre in the medulla, and (2) various afferent nerves. The stimuli capable of exciting vomiting are exceedingly numerous—indigestible food, emetics, intestinal obstruction, peritonitis, constipation, lung disease, pregnancy, renal calculus, cerebral inflammations and tumours, hysteria, shock, disturbances of the balancing centre, and visual or olfactory impressions. Ice, bismuth, hydrocyanic acid, opium, and morphine are local anti-emetics, and counter-irritation over the stomach acts in similar fashion. Opium, morphine, and hydrocyanic acid have also a sedative action on the vomiting centre, whose irritability is likewise decreased by such drugs as chloral, potassium bromide, belladonna, and creosote.

Von Bülow, BERNHARD, COUNT. See BÜLOW.

Vondel, JOOST VAN DEN (1587-1679), Dutch poet, born at Cologne of Anabaptist refugee parents. He returned to Amsterdam as a hosier (1610), was ruined (1658), and pensioned (1668). His works, chiefly tragedies, were published by De Vries (1820) in 21 vols., and by J. van Lennep in 12 vols. (1850-69; new ed. 1888). His *Lucifer* (1654) is said to have been drawn upon by Milton for *Paradise Lost* (begun 1658), as his *Samson for Samson Agonistes*. Vondel first employed Mary Stuart (1646) as a theme for dramatic poetry, translated Horace, Virgil, and Ovid, and wrote beautiful lyrics. His *Palamedes* (1625) satirizes the judicial murder of Barneveldt. See studies by Baumgartner (1882) and Looten (1889).

Von der Decken. See DECKEN.

Voodooism, a degraded form of religion, prevalent among the negroes of Haiti and the southern states of America. It is supposed to be a relic of the fetishistic religion of equatorial Africa; and the word is probably derived from *vaudoux* ('negro sorcerer'), a Creole form of the French *Vaudois* (Waldenses), who were represented by their enemies as addicted to the practice of sorcery and necromancy.

Voragine, JACOBUS DE. See GOLDEN LEGEND.

Vorarlberg, prov. Austria, w. of Tyrol; forms with Tyrol a division of Austria. It covers 1,004 sq. m. The capital is Bregenz. Cattle and goats are raised, and milk products exported. Pop. (1900) 129,237 (mainly German and Roman Catholic).

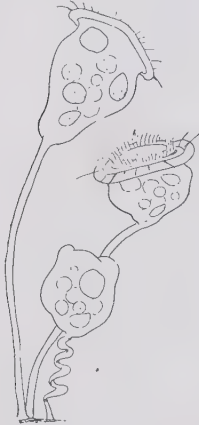
Voronej. (1.) Government of Central Russia, bordered by Orel and Tambov on N. and by Kharkov on S. Area, 25,443 sq. m.; pop. (1897) 2,546,255. The surface is a rolling plain, and belongs to

the Don basin. The chief mineral deposits are iron, ochre, potters' clay, sulphur, and peats. The soil is very fertile (mostly black earth). Market-gardening is a prosperous industry. The larger industrial establishments include sugar refineries, flour mills, iron works, bell-making works, and manufactories of tobacco, soap, and candles. More than 99 per cent. of the people are Russians (three-fifths Great Russians, and two-fifths Little Russians), and belong to the Orthodox Greek Church. (2.) Town, Central Russia, cap. of Voronej gov., 120 m. S.W. of Tambov. It is an episcopal see; has a cathedral and a citadel, with palace of Peter the Great; monuments of Koltsov and Nikitin; an ancient arsenal, now yacht club; a military school and railway engineering college; also manufactures of soap, candles, bricks, bells, tobacco, woollen and linen cloth, and vitriol. Pop. (1897) 84,146.

Vörösmarty, MICHAEL (1800-55), Hungarian poet, born at Nyék, Szekesfeharvar co.; became a teacher and afterwards an advocate, but soon abandoned law for literature. He is best known as the writer of the Hungarian national song *Szozat* (1840); but he also issued plays and epic poems (e.g. *Zalan Futasa, Cserhalom, Eger*) which secured for him the membership of the Hungarian Academy (1830), and subsequently its secretaryship. A complete edition of his works was issued by P. Gyulai (1884) in 12 vols.

Vortex, in hydrodynamics, a kind of motion in which we imagine the smallest parts of the fluid to be whirling or rotating. Sir G. G. Stokes was the first clearly to show that two kinds of fluid motion could be distinguished according as there was rotation or was not rotation in its smallest elements. But we owe to Helmholtz the complete investigation of the fundamental properties of vortex motion in a perfect frictionless or non-viscous fluid. In such a fluid it is not possible either to create or to destroy vortex motion, the property of vorticity being possessed once for all or never. We may imagine the vorticity at a point in a fluid to be represented by a vector drawn perpendicular to the plane of molecular rotation and of length equal to the amount of the vorticity. As we proceed along this line we necessarily pass to an immediately contiguous element also possessing vorticity. The vortex line or filament so traced out will either terminate at the boundary of the fluid or form a re-entrant closed path coming back to the point from which we started. This gives us

the vortex ring. Such a vortex ring will always be composed of the same elements of fluid. It was this conception which led Lord Kelvin to his theory of the vortex atom. The properties just mentioned belong to vortex motion in a non-viscous fluid. But practically there are no such fluids. Because of the existence of viscosity we can create evanescent vortex motions in fluids. Such, for example, are the smoke rings produced at the funnel of a locomotive or at the mouth of a skilful smoker.



Vorticella.

Vorticella, or **BELL-ANIMALCULE**, a ciliate protozoon, found abundantly in ponds and ditches, and even in vegetable infusions. In general appearance it is like an inverted bell, with a long handle, which forms the stalk that attaches the protozoon to the substratum, and has a contractile filament running down its centre. When this filament contracts it throws the stalk into a spiral, and thus brings the bell close down to the substratum. The bell constitutes the body of the animalcule. It is fringed with cilia round the margin, but what would be the mouth of the bell is largely filled up by a plug, called the disc, which also bears cilia. Between the disc and the margin is a groove leading into the interior, which corresponds to the mouth of Paramœcium. Internally there are two nuclei, a large and a small, a contractile vacuole and food vacuoles, much as in other Protozoa. Vorticella is a solitary form; but its near ally Carchesium is colonial, a number of bells occurring on one stalk. The ordinary method of reproduction is by fission. But a process of conjugation occurs in that two or more small free bells swim away, and attach them-

selves to a full grown stationary bell. These then completely fuse together, so that a zygote is formed, which again begins to divide in the usual fashion.

Vortigern (fl. 450), British prince, who called in the Saxons against the Picts and Scots.

Vos, CORNELIS DE (1585-1651), Flemish painter, born at Hulst, where he became dean of the painters' guild (1619). He imitated Van Dyck and Rubens, and became celebrated as a painter of portraits and religious subjects. His portrait of the silversmith Abraham Grapheus is his best performance.

Vos, MARTIN DE (1532-1603), a Flemish painter, born at Antwerp, where, like the preceding, he became dean of the painters' guild (1571); was a prolific artist, his portraits being less corrupted by the Italian spirit than those of his compatriots. He possessed a fertile invention, a ready pencil, and a colouring approaching that of Tintoretto.

Vosges, a frontier dep. of E. France, abutting on Alsace. The surface is mountainous, with the Vosges Mts. in the E. and spurs from the Langres plateau in the W. The upper Moselle, on which the capital, Epinal, stands, bisects the department. Much of the mountainous area is under wood; the W. is agriculturally fertile (notably in wheat, cheese, and wine); and the department possesses mines of coal, silver, lead, and copper, quarries of lithographic stones, and, above all, many mineral springs, as at Plombières and Contrexéville. Important manufactures are those of iron and steel (at Epinal and Bru), and embroidery and lace (at Mirecourt and St. Dié). Area, 2,303 sq. m.; pop. (1901) 421,104.

Vosges Mountains (Ger. *Vogesen* or *Wasgau*) separate the French departments of Meurthe-et-Moselle and Vosges from the German territory of Alsace-Lorraine. Starting from Basel northward, they border the left side of part of the Rhine valley, and throw off the rivers Saar and Moselle to the N. The highest point, Ballon de Guebwiller (about 4,680 ft.), is at the S. end. The Vosges valleys are specially noted for cattle, and the W. slopes are thickly forested.

Vosmaer, CAREL (1826-88), Dutch poet and art critic, born at the Hague. Till 1873 he followed the legal profession. His first volume of poems appeared in 1860, followed by *Rembrandt* (1869) and *Birds of Diverse Plumage* (1872-6). After a visit to Alma Tadema (1873) he produced *Londinias* (1878), a mock-heroic poem. His works also include *Homer*, translated into hexameters; *Nanno* (1882), an

idyll; and *Amazone* (1881), an archæological novel. As editor of the *Nederlandsche Spektator* he played an influential part in reawakening Dutch literature.

Voss, JOHANN HEINRICH (1751-1826), German poet, philologist, and translator, born at Sommersdorf (Mecklenburg); was a schoolmaster at Otterndorf (1778) and at Eutin (1782), removing (1802) to Jena, and becoming professor at Heidelberg (1805). He engaged in controversy with Heyne, whose pupil he had been (*Mythologische Briefe*, 1794); with Creuzer (*Antisymbolik*, 1824-6); attacked Stollberg and Schlegel (*Kritische Blätter*); and was one of the chief spirits in the poetic republic of the *Göttinger Dichterbund*. His original idyll *Luise* (1795) suggested *Hermann und Dorothea* to Goethe. Excelling in the use of the hexameter, he translated *Homer* (1793), *Virgil's Georgics* (1789) and *Eclogues* (1797), *Ovid's Metamorphoses* (1799), *Horace* (1806), *Bion* (1808), *Hesiod* (1806), *Tibullus* (1810), *Propertius* (1830), *Aristophanes* (1821), *Shakespeare* (1818-29), and *Aratus* (1824). His *Gedichte* (collected 1802) were not the least important of his works. His *Sämtliche Werke* appeared in 5 vols (1853). See *Lives* by Paulus (1826) and Herbst (1872-6).

Vossius, GERHARD JOHANN (1577-1649), Dutch scholar, born near Heidelberg; became rector of the high school at Dordrecht (1600), director of the theological college at Leyden (1615-19), and professor of rhetoric there (1622). Crossing to England, he was made canon of Canterbury Cathedral (1629). He returned to Holland, and was appointed professor of history in the University of Amsterdam (1631). His chief work was his *Historia Pelagiana* (1618).

Vossius, ISAAC (1618-89), Dutch philologist, son of Gerhard, born at Leyden. He travelled extensively over Europe, collecting MSS., and on the invitation of Queen Christina resided in Stockholm (1649-52). He settled in England (1670), and was appointed canon of Windsor (1673). His works include scientific treatises (*De Motu Marium et Ventorum*), a book of table talk (*Scaligerana*), a criticism of religion (*De Sibyllinis aliisque quæ Christi Natalem præcessere Oraculis*), and editions of the classics (*Catullus*, 1684).

Votan, legendary lawgiver and civilizer of Central America, more especially of Mexico. He was stated to have come from overseas, and to have found there a rude and uncivilized people, dressed in the skins of wild animals, and living on roots and fruits and raw flesh, but speaking one common language. This last

he supplanted by his own tongue, Nahuatl. He taught the people a knowledge of the supreme deity, gave them a settled government, and instructed them in some of the arts of civilized life. He was subsequently deified. Votan's civilization was supplanted by that of the Mayas. See Brasseur de Bourbourg's *Histoire des Nations Civilisées du Mexique et de l'Amérique Centrale* (4 vols. 1857-9).

Vote. See ELECTIONS.

Vow, an obligation voluntarily undertaken before God. Vows were practised by all nations of antiquity—e.g. Jephthah's vow. Though they were not encouraged by Jesus Christ, there are instances of vows among the early disciples (Acts 18:18; 21:23). The Roman Catholic Church has systematized the taking of vows and their operation. Dispensation from minor vows may be obtained from a religious superior or bishop; but such vows as that of chastity or membership in a religious order may only be dispensed by the pope. A distinction is made between 'simple' and 'solemn' vows. Solemn vows are defined as those of poverty, obedience, and chastity, which admit the maker of them into the 'religious' state. The only vows officially recognized by the Church of England are the baptismal vows and the marriage vows. Vows, however, are not unfrequently made in connection with brotherhoods and sisterhoods, which are recognized by the bishop of the diocese according to his discretion.

Vowel. See PHONETICS.

Voysey, CHARLES (1828), founder of the Theistic Church, was born in London. Ordained a clergyman of the Church of England, he was deprived in 1871, in consequence of certain publications which were adjudged heterodox. His principal work has been *The Sling and the Stone*, in 10 vols. (1872-93).

Voznesensk, tn. and river port, Kherson gov., S. Russia, 80 m. N.N.E. of Odessa, on the S. Bug; with a cathedral, former royal palaces, and fine public gardens. Pop. (1897) 14,178.

Vranya, tn., cap. of Servian co. of same name, near southern extremity of the kingdom, on the upper Morava; has rope manufacture. Pop. (1900) 11,921.

Vratsa, tn., Bulgaria, on N. slope of the Balkans, 38 m. N.N.E. of Sofia; has tanneries, and wine, silk, and jewellery industries. Pop. 15,000.

Vryburg, tn., cap. of dist. of same name, British Bechuanaland, S. Africa, 130 m. by rail N. of Kimberley; was capital of the republic of Stellaland. Pop. (1904) 5,122.

V.S., Veterinary Surgeon.

Vulcan, the name given by Leverrier to a supposed intra-Mercurian planet, the existence of which he predicted in 1859. Lescarbault assigned to this pseudo-planet a period of twenty days, and a mass somewhat exceeding that of Mercury, and fixed dates for its future transits. They, however, failed to take place, and Leverrier's observation is now admitted to have been illusory. Illusory, too, was the hurried recognition of Vulcan by the American astronomers Watson and Swift during the total eclipse of July 29, 1878.

Vulcan (Lat. *Vulcanus*), in ancient Roman mythology the god of fire; identified with the Greek Hephestus. His worship was said to date from the time of Romulus. His chief festival was on August 23.

Vulcanizing and Vulcanite. See INDIA-RUBBER.

Vulcano. See LIPARI ISLANDS.

Vulgate, the authorized Latin version of the Bible, made by Jerome (383-405 A.D.). At its foundation lies a previous Latin version, the Old Latin, sometimes unwarrantably called the Itala, which probably came into existence at Carthage. In this, the Old Testament translation, embracing also the Apocrypha, was made from the Septuagint, while the New Testament omitted three epistles (Hebrews, James, 2 Peter). About the year 382 Pope Damasus requested Jerome to prepare a revision of the New Testament. Jerome began with the gospels, which he emended with great caution and care (383), then passed on to the rest of the New Testament, which was executed with less thoroughness. Next he took in hand the Old Testament. Of the Psalms he had made two revisions, called the Roman and Gallican respectively, the latter of which still stands in the Vulgate. By the 6th century this version was officially recognized by Gregory the Great. Attempts to find out Jerome's actual text began to be made—e.g. by Alcuin (c. 801), Theodulf, bishop of Orleans (c. 800), Lanfranc (c. 1070), Stephen Harding (c. 1150); finally, R. Stephens was able to issue (1528) a fairly valuable critical edition. The Council of Trent (1546) having declared Jerome's work to be authentic (probably, that is, authoritative and accurate), and made an injunction as to correct printing, Hentenius of Louvain (1547) brought forth his beautiful folio edition. There was as yet, however, no real uniformity, and it was not till 1590 (Pope Sixtus v.) that a fully authorized edition appeared. Even this gave place in 1592 to the issue made under Clement VIII., which,

as revised in 1598, became the definitive Roman Catholic edition. The differences between the Vulgate and the English Bible, apart from variations in rendering, are confined mainly to the order in which the books appear, the chapter divisions, and the presence or absence of the Apocrypha; and these only relate to the Old Testament. See Kaulen's *Geschichte der Vulg.* (1868), and *Handbuch zur Vulg.* (1870); Berger's *Histoire de la Vulg.* (1893); Nestle's *Uebersetzungen der Bibel* (1897); Scrivener's *Introd. to Criticism of N.T.* (4th ed.); editions of the Vulgate by Vercellone (1861), Tischendorf (N.T., 1864).

Vulpecula, a small constellation to the south of Cygnus in a dense part of the Milky Way, formed by Hevelius (d. 1687), and formerly called *Vulpecula et Anser*. The wonderful 'dumb-bell' nebula, Messier 27, belongs to this constellation.

Vulture, a name applied to the members of two families of birds of prey—the American Cathartidae and the Old World Vulturidae. In both families the bill is strong and hooked, and the head and neck largely bare of feathers; the legs are strong, but the feet and claws are somewhat weak, so that the birds cannot carry off their food as the eagles can. The sexes are alike in plumage, and the powerful wings have eleven primaries. Vultures sometimes reach a great size, this being specially true of the American forms, and they have a powerful and sustained flight. The food consists of carrion, though the larger forms will attack feeble or disabled animals. The sight is exceedingly keen. In many cases they have a singularly unpleasant odour, which, combined with their naked heads, renders them very repulsive. Of the Cathartidae, important forms are the condor, the turkey-buzzards, and the carrion crow or black vulture (*Catharista atratus*), the last extending north to Carolina. The turkey-buzzards are common in the towns and villages of tropical and temperate America, where they act as scavengers. Of the Old World Vulturidae, examples are the black vulture (*Vultur monachus*) of the Mediterranean region, the griffon vulture (*Gyps fulvus*) of Southern Europe, and the small Egyptian vulture, or Pharaoh's hen (*Neophron peronotus*), which is so frequent in Egyptian hieroglyphics. The last named is raven-like in appearance, and has a very varied diet. It measures only two feet in length as against the three and a half feet of the griffon vulture.

Vurjeevandas, MADHOWDAS (1817-96), Hindu merchant and philanthropist, was born in Kathiawar, and established himself in business in Bombay. In honour of his father he constructed and endowed the Mad-

Vyatka. (1.) Government, N.E. Russia, bounded on E. by Perm. Area, 59,329 sq. m. Pop. (1897) 3,082,788. The surface is fairly level, thickly wooded in many parts, and cut up by rivers. Almost the whole area is in-

of potter's earth, millstones, and sulphur exist. The chief crops are rye, oats, and barley; potatoes, flax, and hemp are also grown. The industries include shoe, match, paper, cloth, tobacco, and furniture manufactories, fulling mills, flour mills, iron and glass works, and locksmiths' shops. Excellent lace is made, and every kind of woodwork is practised. Russians comprise 78 per cent. of the people; the remaining 22 per cent. are Votiaks (over 300,000), Cheremissians (about 130,000), Tartars (114,000), Bashkirs, and Permiaks. (2.) Town, Russia, cap. of Vyatka gov., nearly 200 m. N. of Kazan, on the Vyatka. It is a river port and episcopal see, with a splendid cathedral (1883), and remains of ancient citadel and ramparts. It has manufactories of tobacco, glue, soap, paper, candles and tapers, leather, silver and copper articles, and ecclesiastical art objects. It was founded from Old Novgorod about 1180-1, and is still called Noûgrad by Tartars and Cheremissians. Pop. (1897) 24,782.

Vyazma, tn., Smolensk gov., Central Russia, 90 m. E.N.E. of Smolensk; with a cathedral (1596) and citadel, and tanneries, manufacture of leather goods, tobacco, and gingerbread, this last famous all over Russia. Pop. (1897) 15,676.

Vyernii, formerly ALMATY, tn., Russian Central Asia, cap. of Semirechensk prov., 382 m. E.N.E. of Tashkend, at N. foot of Transilian Ala-tau, 2,405 ft. above sea-level. It has a cathedral, a school of horticulture, a Mohammedan college, and considerable trade. Cattle-breeding and bee-keeping are carried on. Vyernii is famous for its Nestorian inscriptions (from 8th century). Earthquakes are frequent; an especially severe one occurred in 1887. Pop. (1897) 22,982.

Vyrnwy, riv., Wales, rises in N.W. Montgomeryshire, and joins the Severn on the Shropshire border. Its upper valley has been converted into a lake (alt. 825 ft.) by a dam 1,225 ft. long and 60 ft. high, forming the head reservoir for the Liverpool water supply (1893).

Vyshnii-Volochok, tn., Tver gov., Central Russia, 68 m. N.W. of Tver city; with cotton mills. The Vyshnii-Volochok system is one of the three canal systems uniting the Baltic and Caspian basins. It was constructed by Peter the Great (1703-9). Pop. (1897) 16,722.



Species of Vultures.

1. Egyptian vulture. 2. Condor. 3. Griffon vulture. 4. Black vulture. 5. King vulture. 6. Turkey vulture.

how Bang, for the use of poor Hindus; built *dharmushalas* at Bombay and at Nassick, a sanatorium at Zion Hill (Bombay I.), a dispensary at Matoonga (Bombay I.); and instituted an annual feast for the poor of his caste.

cluded in the Volga drainage region, through the Kama (320 m. within limits of government) and the Vyatka. Marshes are very extensive. The chief mineral is iron; copper, mixed with iron ore, is also extracted; deposits

W

W. English *w* is closely related to the vowel *u*, and may be termed consonantal *u*. It is probable that Latin *V* or *U*, which were formerly undistinguished, had this value after *Q*. *W* is simply *V* written twice. It appears from the 6th century (Wattenbach) as a means of distinguishing consonantal *U*. In words like 'queen' *u* itself is still employed consonantly. In modern Welsh *w* is a vowel with the value of Latin *u*, as well as a consonant (Pwllheli). This was at one time an English usage also (13th and 14th centuries). Such words as 'new' and 'how' still supply an analogy to it. It provides a much-needed addition to the weak representation of vowels in the Latin alphabet.

Waagen, GUSTAV FRIEDRICH (1794-1868), German art critic, born at Hamburg; came into prominence through the publication of his *Ueber Hubert und Johann van Eyck* (1822) and *Kunstwerke und Künstler in England und Paris* (1837-9), which was subsequently enlarged and republished in English as *The Treasures of Art in Great Britain* (1854-7), with a supplement, *Galleries and Cabinets of Art in Great Britain* (1857). His other works include *Kunstwerke und Künstler in Deutschland* (1843-5) and *Die vornehmsten Kunstdenkmäler in Wien* (1866-7). From 1830 he was keeper of prints in the Berlin Museum.

Wabash, tn., cap. of Wabash co., Indiana, U.S.A., on the Wabash, 40 m. s.w. of Fort Wayne; has railway workshops, bridge-building and iron works, and manufactures of agricultural implements and of paper. Pop. (1900) 8,618.

Wabash, riv., United States, a right-hand branch of the Ohio, rises in n.w. of Ohio state and flows s.w. across Indiana, thence nearly s. along the w. boundary of that state to its junction with the Ohio near Shawneetown. The drainage area is 33,725 sq. m., and its total length 517 m. It is navigable to Lafayette, Indiana. The Wabash and Erie canal connects the river with Lake Erie.

Wace (fl. 1170), chronicler, born in Jersey (1100?); settled at Caen before 1136; received a prebend at Bayeux from Henry II. (1169?). His works were *Roman de Rou*, a poetical history of the Norman dukes, and *Brut*.

Wace, HENRY (1836), dean of Canterbury, was born at London; delivered the Boyle Lectures (1874-5); was Bampton lecturer (1879), and became professor of ecclesiastical history in King's

College, London (1875). He was made a prebendary of St. Paul's, London (1881), and principal of King's College (1883). He was chaplain of Lincoln's Inn (1872-80), and preacher of Lincoln's Inn (1880-96). He belongs to the more liberal evangelical party.

Wacht am Rhein ('Watch on the Rhine'), German national song, written (1840) by Max Schneckenburger, composed in its popular form (1854) by Karl Wilhelm. It was the battle-song of the German army (1870-1).

Wächter, KARL GEORG VON (1797-1880), German jurist, born at Marbach on the Neckar; became assessor of the Court of Appeal at Esslingen (1819). He was appointed rector of Tübingen University (1825), professor of law at Tübingen (1819) and at Leipzig (1833), professor and chancellor at Tübingen (1836), and professor of Roman law at Leipzig (1852). He was president of the Würtemberg chamber (1839-49). His works include *Beiträge zur Deutschen Geschichte* (1845), *Gemeines Recht Deutschlands* (1844), and *Die bona Fides* (1871). See *Life*, in German, by Wächter (1881).

Waco, city, Texas, U.S.A., co. seat of McLennan co., on Brazos R., 95 m. N.E. of Austin; manufactures saddlery and harness. Pop. (1900) 20,686.

Wad, a hydrated manganese dioxide, occurring in brownish black, earthy masses, and probably formed by the action of air and moisture on other manganese minerals. It is chiefly employed in the preparation of chlorine, and as a pigment.

Wadai, Mohammedan sultanate, in Central Sudan, Africa, E. of Lake Chad; area estimated at 170,000 sq. m., and population 2,000,000, chiefly Mabas. The S. and E. are fairly fertile; the N. is arid generally. Ivory and ostrich feathers are exported. Abeshr is the residence of the sultan. Wadai has been in the French sphere of influence since 1898, and under French protection since 1903.

Waddington, WILLIAM HENRY (1826-94), French ambassador, was born at St. Rémy, of English parents, and educated at Rugby and Trinity College, Cambridge. After travelling in Asia Minor (1850-62), he in 1865 was elected a member of the Academy of Inscriptions and Belles-Lettres. He was elected to the National Assembly in 1871, and in May 1873 was minister of public instruction in the Dufaure cabinet for seven days. Waddington was returned

to the Senate in 1876, was again minister of education (1876-7), and then minister of foreign affairs (1877-9) in the government of Jules Simon. In July 1878 he proceeded as chief French plenipotentiary to the Berlin Congress. He became premier in February 1879, but resigned in the following December. He accepted the London embassy in July 1883, and until 1893 played a great part in maintaining friendly relations between Great Britain and France.

Wade, GEORGE (1673-1748), British field-marshal. He served in the French war, and gained laurels at Almanza (1707), Saragossa (1710), and other battles; took part in suppressing the rebellion of 1715, in the expedition against Vigo (1719); was elected M.P. for Bath (1722). He constructed great military roads in Scotland (1726-40); was appointed field-marshal (1743), commanding the forces in Flanders against the French.

Wade, THOMAS (1805-75), English poet, born at Woodbridge, Suffolk. For a time he edited *Bell's Weekly Messenger* and then the *British Press*. He married the pianist Mrs. Lucy Bridgman. In 1825 Wade published *Tasso and other Poems*. His dramatic setting of Griselda's story, *Woman's Love, or the Triumph of Patience* (afterwards called *Duke Andrea*), was successfully played in 1828; but *The Jew of Arragon, or the Hebrew Queen* (1830) failed on the stage. A volume of miscellaneous poems—*Mundi et Cordis Carmina*—appeared in 1835. In 1839 appeared *Prothanasia*, a blank verse poem. Wade produced in 1846 a version of Dante's *Inferno*, the first in the original metre. Several of his poems are included in Nicoll and Wise's *Literary Anecdotes of the Nineteenth Century* (1895).

Wade, SIR THOMAS FRANCIS (1818-95), British diplomatist, born in London. He was appointed to the missions of Lord Elgin (twice) and Sir F. Bruce (1857-60), and became minister plenipotentiary at Peking (1871). He was made K.C.B. (1875). He retired in 1883, and was appointed professor of Chinese at Cambridge (1888). Wade wrote *Notes on the Chinese Empire* (1850), *Yü-yen Tzu-erh Chi: A Progressive Course in Colloquial Chinese* (1867).

Wadelai, tn., on l. bk. of Upper Nile, Africa, 40 m. N. of the Albert Nyanza, was the centre of Emin Pasha's equatorial province prior to his relief by Stanley in 1889. It came under British influence in 1894.

Wadhwan, chief tn. of Wadhwan state, Kathiawar peninsula, Bombay, India, 66 m. S.W. of Ahmedabad. Industries—saddlery and manufacture of soap. Pop. (1901) 16,223. The state has an area of 237 sq. m., and a population of 45,000.

Wadi, **WADY**, or **DONGA**, a river-course which is only temporarily filled with running water. Wadis are found in arid areas.

Wading-birds. See **GRALLATOES** and **BIRDS**.

Wadset, an obsolete form of security over land in Scotland, created by conveying the land to the creditor or wadsetter, with the obligation to redeem the land on payment of a specified sum by the debtor or reverser. In proper wadset, the wadsetter takes the land in pledge, rents and profits going to the extinction of interest. In improper wadset, the wadsetter takes the rents, but must account for them after paying principal and interest.

Wadstena. See **VADSTENA**.

Wady. See **WADI**.

Wady Halfa, tn., Egypt, just below the second cataract, 500 m. S. of Cairo. Communication with Assuan is by steamer, and with Khartum by rail.

Wady Musa, modern name of Petra, N. Arabia, due to the tradition that the stream issuing through the gorge which defends the entrance to the city, set in a hollow of the Edomite mountains, was the one stricken from the rock by Moses (Num. 20: 7-13).

Wafer, an adhesive disc for securing letters or sticking papers together. Common wafers are punched out of a paste made of very fine flour, which is pressed between two heated plates of smooth iron. Transparent wafers are made of isinglass or gelatin, dried upon plate glass, and punched out in various forms and sizes. The gummed envelope has put wafers into disuse. For the liturgical use of the word, see **HOST**.

Wafflard, **ALEXIS JACQUES MARIE** (1787-1824), French dramatist, wrote most of his plays in collaboration with J. D. Fulgence de Bury, known as 'Fulgence.' The chief of these, which as a rule are satirical comedies of middle-class life, executed with considerable wit, are—*Un Moment d'Imprudence* (1819), *Un Voyage à Dieppe* (1821), *Les Deux Ménages* (1822), *Le Célibataire et l'Homme Marié* (1824). Of the plays written by himself alone the chief are—*Haydn* (1812), *Le Voile d'Angleterre* (1814), *Un Promenade à Saint-Cloud* (1817), *Un Jeu de Bourse* (1821), *L'Ecolier d'Oxford* (1824).

Wageningen, tn., Netherlands, prov. Gelderland, near r. bk. of Rhine, 11 m. W. of Arnhem,

with an agricultural institute. Pop. (1900) 9,027.

Wager, a mutual contract by which each of two parties covenants to pay a sum to the other, the one in case of a future event happening, the other in case of its not happening. Wagers were made irrecoverable at law by the Gaming Act (1845), which was extended by the Gaming Act (1892) to the case of money paid by a third party at the request of the loser.

Wager, **SIR CHARLES** (1666-1743), British admiral. In 1708, when in the W. Indies, he fell in with a Spanish treasure fleet off Cartagena, and captured one ship heavily laden with treasure, but unfortunately sank the far richer ship of the Spanish admiral. He was appointed a lord of the Admiralty in 1718. In 1731 he was made an admiral, and in 1733 was appointed first lord. In 1742 he obtained the post of treasurer of the navy.

Wager of Battle. See **BATTLE**, **TRIAL BY**.

Wager of Law. In England formerly the defendant in an action to obtain specific restitution of goods wrongfully detained might discharge himself from the claim by wagering his law—that is to say, he came into court and swore to his innocence, and brought eleven of his neighbours (oath-helpers or compurgators) to swear that they believed his denial to be true. Wager of law was abolished by statute in 1883.

Wages, the term used to denote the reward or remuneration of labour. Wages may be paid by time or by piece, or by a combination of the two. The chief objection to time wages is that they may encourage idleness, and the main drawback of piece wages is considered to be a temptation to scamping. In industries where the quality of the work is important time wages are generally preferred. Nor is it accurate to say, as it is sometimes alleged, that workmen invariably object to piecework. They contend, indeed, that it promotes overstrain; but where the circumstances of the industry allow of definite scales of payment being fixed by negotiation between masters and men acting as a body through their associations, trade unions are frequently parties to such arrangements. With a minimum payment thus determined, a bonus may sometimes be given in addition, proportioned to the quantity or quality of the work performed, and such wages have been distinguished as 'progressive wages.' The general rate of wages in a country, like the particular rates in special industries, is determined by forces operating on supply and demand.

At one time the 'wages-fund' doctrine, as it was called, occupied a large place in economic discussion. It maintained that a certain sum was set aside for the payment of wages in a country, and that they could only be altered by increasing this sum, which was possible by a gradual process alone, or by diminishing the number of the labourers among whom it was divided. At any particular moment the sum to be spent in wages was predetermined. Wages accordingly became a question of the relation between the capital devoted to the payment of labour and the numbers of the population. Hence economists laid special stress, on the one hand, on the desirability of encouraging the growth of capital, and the danger of diminishing it by wasteful expenditure, or alarming it by confiscating legislation; and, on the other, they made their judgment of different schemes of social reform hinge upon their respective effects on population. The wages-fund theory has been generally discarded. Now, by contrast, wages are represented as a 'flow' rather than a 'fund.' The product, which is being continually created, and may be affected by the efficiency of the labourers themselves, fixes the amount which can and will be paid. It is true that wages may often be advanced from capital. It is certain that the general structure of business, and the existing distribution of capital between different objects, have an important bearing on the possibilities of employing labour, and that such conditions can only be slowly altered. It is also true that the standard of comfort recognized by the labourers, below which they will hesitate to marry, does not fail to influence the numbers of the people, and to affect the competition for employment. Wages depend on the demand for labour, and on its supply. The total amount of wealth produced, which itself is affected, among other causes, by the efficiency of labour, sets the maximum limit. The division of this 'national dividend,' as it has been called, between the several agents of production is determined by the urgency with which each requires the services of the others. The demand for labour, accordingly, depends on the need the other agents feel for its services, and on its relative scarcity or comparative abundance. The growth of population is not unimportant; but the action of public opinion, the protection of the law, and the combination of the workers themselves in a trade union, may be equally important. Wages generally tended to rise

in civilized countries during the latter part of the 19th century. In the case of the bankruptcy of the master, four months' salaries of clerks and servants up to £50, and two months' wages of labourers or workmen up to £25, are paid in priority to all other claims. An infant can maintain a claim for wages up to £50 in the county court. By the Wages Attachment Abolition Act, 1870, the wages of any servant, labourer, or workman cannot be attached for debt, while by the corresponding Scottish Act (33 and 34 Vict. c. 63), similar protection is given, except as regards any surplus over 20s. per week.

The wages of masters and seamen accrue from day to day, are no longer subject to the earning of freight, and give rise to a maritime lien. Under £50, they should be recovered in a court of summary jurisdiction, except where the owner is bankrupt, or the ship under arrest.

Wages are specially handled in F. A. Walker's *The Wages Question* (1876). W. T. Thornton's *On Labour* (ed. 1870), and F. D. Longe, in his *Criticism of Mill's Theory of Wages*, assailed the wages-fund doctrine so successfully that J. S. Mill himself (*Dissertations and Discussions*, vol. iv.) abandoned the theory. F. W. Taussig, in *Wages and Capital* (1893), has carefully re-examined the theory. D. F. Schloss's *Methods of Industrial Remuneration* (1892) supplies an exhaustive account and detailed criticism of different species of wages. Mr. and Mrs. Webb's *Industrial Democracy* (1897) states and examines the attitude and action of trade unions.

Wagga-Wagga, tn., co. Wynyard, N.S.W., Australia, on l. bk. of Murrumbidgee, 73 m. N. of Albury. It is the centre of trade for a large surrounding district. Pop. (1901) 5,114.

Wagner, ADOLF (1835), German political economist, born at Erlangen; was appointed professor of political economy at Dorpat (1865), at Freiburg (1868), and at Berlin (1870). He is the author of *Beiträge zur Lehre von den Banken* (1857), *Die Geld- und Kredit-theorie der Peelschen Bankakte* (1862), *Die Ordnung des Oesterreichischen Staatshaushalts* (1863), *Finanzwissenschaft* (1883-9), and *Handbuch der Politischen Oekonomie* (4th ed. 1896).

Wagner, RUDOLF (1805-64), German physiologist and anatomist, born at Bayreuth; went to Paris to study under Cuvier; became professor of zoology at Erlangen (1833), and in 1840 succeeded Blumenbach in the chair of physiology at Göttingen. He wrote a *Handwörterbuch der*

Physiologie (4 vols. 1842-53), *System of Physiology* (Eng. trans. 1844), and *Comparative Anatomy* (Eng. trans. 1845). He was also a leading advocate of scientific spiritualism, as against the materialism of such men as Vogt, his principal book in this field being *Der Kampf um die Seele* (1857).

Wagner, SIEGFRIED (1859), German musical composer, son of Wilhelm Richard; studied

Liebesverbot, and Acts 1 and 2 of *Rienzi*. In 1839 he proceeded to Paris. Here his hopes that his opera *Rienzi* would be produced were not fulfilled. Wagner, whilst slaving at literary and musical hack work to procure the necessities of life, finished the music to *Rienzi*, and composed his *Faust* overture and *The Flying Dutchman*. In 1842 he left Paris for Dresden, where he had secured the accept-



Wilhelm Richard Wagner.

(Photo by Elliott & Fry.)

composition under Humperdinck, and has produced two operas, *Der Bärenhäuter* and *Herzog Wildfang*, both of which were first performed in Munich.

Wagner, WILHELM RICHARD (1813-83), German musical composer and *littérateur*, was born in Leipzig. From 1833-9 he held appointments as conductor in Würzburg, Magdeburg, Königsberg, and Riga, and during this period composed amongst other works the operas *Die Feen*, *Das*

ance of *Rienzi*. The successful production of this work was followed a few months later by that of *The Flying Dutchman*, and soon afterwards he received the appointment of musical director. While in Dresden he composed *Tannhäuser* (produced there in 1845), *Lohengrin* (finished in 1848; produced by Liszt in Weimar, 1850), and also made some progress with the 'book' of *Der Ring des Nibelungen*. In 1849, owing to his participa-

tion in the revolutionary (constitutional) movements, he had to flee the country, and it was not until 1862 that he returned to Saxony. Whilst in exile at Zürich he composed portions of *Das Rheingold*, *Die Walküre*, *Siegfried*, and *Tristan und Isolde*. In 1855 he acted as conductor at the London Philharmonic Society's concerts. The summer of 1861 was passed in Vienna, where he for the first time heard *Lohengrin* performed; but his efforts to secure the production of *Tristan* were unsuccessful. In 1864 he was granted a pension by Ludwig I. of Bavaria, and after a year in Munich he removed to Tribschen, near Lucerne. Here he finished (1867) the *Meistersinger* (a serio-comic opera) and *Siegfried* (1869), and began (1870) the music of *Götterdämmerung*. In 1870 he married for his second wife Cosima, a daughter of Liszt, and formerly the wife of Von Bülow. In 1872 he settled finally in Bayreuth, where in the same year a theatre was begun expressly for the production of his operas. The inauguration (1876) of this theatre was celebrated by the first performance in its entirety of the *Nibelungen Ring*, or tetralogy, of which the individual parts—*Rheingold* (the introduction), *Walküre*, *Siegfried*, and *Götterdämmerung*—are each of about the dimensions of a complete opera. *Parsifal*, his last and perhaps greatest work, was produced at Bayreuth in 1882. It was not until he was nearing manhood that Wagner began the serious study of music. On hearing Beethoven's symphonies he was inspired with the idea that, were such glorious music united to suitable language, musical drama could be made one of the greatest intellectual forces in existence. He was his own librettist and stage manager, and the literary excellence of his librettos and his skilful management of scenic effects were scarcely less remarkable than his technical equipment as a musician. His first important work, *Rienzi*, was composed in the style of French grand opera; but in his ultimate creation of what he conceived to be the perfect form of musical drama he entirely discarded all previous rules and limitations. Wagner abandoned all set forms, believing with Peri and Caccini, the founders of modern opera, that a series of definite musical movements impeded the action of the drama. Further, he assigned an equal degree of importance to poetry, music, and scenery, and he was also the first to make the *leitmotif* an outstanding feature in operatic works. His music is strikingly original, and he was a

supreme master of instrumentation. Though his genius was exercised almost exclusively in the domain of opera, he is universally regarded as one of the greatest musicians of his generation; and his productions have influenced, more or less perceptibly, nearly all subsequent compositions in every branch of music. His literary works, a number of which have been translated into English, are published in ten volumes (1871-83; new ed. 1888). Perhaps the best *Life* is Jullien's (1886). See also the *Lives*, in German, by Glasnapp (1882), Pohl (1883), Tappert (1883), and Wolzogen (1883); Praeger's *Wagner as I Knew Him* (1892), Hueffer's *Richard Wagner and the Music of the Future* (1874), *Correspondence between Wagner and Liszt* (Eng. trans. 1888), *Wagner's Letters to Dresden Friends* (Eng. trans. 1890), and *Gedichte von Richard Wagner*, ed. by C. F. Glasenapp (1906).

Wagram, vil., Lower Austria, 12 m. N.E. of Vienna; was the scene of the defeat of the Austrians under Archduke Charles (July 5 and 6, 1809) by Napoleon.



Wagtail.

Wagtail (*Motacilla*), a genus of insectivorous passerine birds, related to the pipits. The wagtails and the pipits together constitute the family Motacillidae, whose members are chiefly found in the Old World. The wagtails are distinguished by their long tails, the bright colours of their plumage, and their migratory habits. They are found either near water or in meadows, and seek their food upon the ground. They run swiftly, the movements of the tail during running giving rise to the popular name. Both bill and feet are slender, and the flight is undulatory. Five species of *Motacilla* occur in Britain. The commonest species are the white wagtail (*M. alba*) and the closely-allied pied form (*M. lugubris*), which are said to interbreed. Others are the gray wagtail (*M. melanope*), the blue-headed wagtail (*M. flava*), and the yellow wagtail (*M. Rayi*). There are about twenty-five other species, several of which are African.

Wahabis, a sect of Mohammedans, founded about the middle of the 18th century by one Mohammed Abdul Wahab, in Nejd in Arabia. He proclaimed anew the sovereign validity of the original Koran; denounced traditional glosses, saint worship, and pilgrimages (except that to the Kaaba at Mecca); condemned luxury in dress and living; and prohibited the use of wine and tobacco. The youthful prophet was driven from city to city until he found an asylum with an Arab chief named Mohammed Ibn Sa'ud. A puritan crusade was then undertaken, which was crowned by the conquest of Medina, and resulted in the establishment of a militant church, at issue both with the infidel and with other forms of Islam. After a conflict of nearly thirty years, Ibrahim Pasha of Egypt succeeded, in 1818, in crushing the temporal power of the Wahabis in Arabia. In 1831, Wahabi warriors in India suffered defeat at the hands of the Sikhs. The Wahabis are still found in Arabia, Upper and Lower Egypt, India, and Turkey.

Wahsatch Mts., a rugged mountain mass in Utah, U.S.A., running N. and S., and forming the E. wall of the Great Basin. Mount Nebo, one of the chief peaks, reaches 11,680 ft. One of the spurs, the Uintah Mts., runs along the N.E. boundary, and contains Gilbert Peak (13,687 ft.).

Wai, tn., on Krishna R., Satara dist., Bombay Presidency, India, 39 m. S. of Poona. It is a sacred place and a pilgrim resort, and contains several Hindu temples. Pop. (1901) 13,989.

Waif. (1.) Waifs are goods thrown away by a thief in his flight. They used to belong to the crown, or the lord of the manor, if the crown or the lord could seize them; but if the owner prosecuted the thief to conviction, he could recover his goods if he claimed them within a year. Now, if goods are stolen and the offender prosecuted to conviction, the property in the goods reverts to the owner. (Larceny Act, 1861, s. 100; and Sale of Goods Act, 1893, s. 24.) (2.) By the common law of England a woman could not be outlawed, but she could be waived or declared a waif. See also ESTRAYS.

Waikato, riv., New Zealand, 200 m. long, rises on slopes of Mount Ruapehu in North Island, and flows through Lake Taupo, 4 m. below which it precipitates itself over the Huka Falls (30 ft. high). After flowing N.W. for the main part of its course, it makes a sharp turn to the W., and discharges into the N. Taranaki Bight. It is navigable for river steamers for 75 m. from its mouth.

The valley of the Waikato was the scene of the chief conflicts between the British troops and the Maoris in 1863 and 1864.

Wainewright, THOMAS GRIFRITHS (1794-1852), English writer and poisoner, born at Chiswick. He studied art, and exhibited at the Royal Academy (1821-5). *Some Passages in the Life of Egmont Bonnot* appeared in 1827. Wainewright poisoned his uncle (1829) for his property, and his sister-in-law (1830) for her insurance, his mother-in-law sharing the same fate (1830). In 1837 he was transported for life for a forgery committed in 1826.

Waits, street musicians, now heard only at Christmastide, but formerly, especially in the 17th century, an established institution, wearing 'waits badges' with the town arms. Those of Exeter existed as early as 1400. Their instruments (hautbois) were also styled 'waits,' and the same title was extended to the night guard of the city of London.

Waitz, GEORG (1813-86), German historian, born at Flensburg, Schleswig. He was a pupil of Ranke. In 1842 he became professor at Kiel. In 1849 he accepted a chair at Göttingen, and there formed a school of historians, becoming (1875) member of the Berlin Academy, and director of *Monumenta Germaniae Historica*. His works include *Deutsche Verfassungsgeschichte* (8 vols. 1844-78); *Schleswig-Holsteins Geschichte* (1851-4); *Lübeck unter Jürgen Wullenweber*, a statesman of the Hanseatic League (1855-6); *Ueber das Leben und die Lehre des Ulfila* (1840); *Das alte Recht der salischen Franken* (1846); *Deutsche Kaiser von Karl dem Grossen bis Maximilian* (1862). See *Studies* by Steindorff (1886) and Kluckhohn (1887).

Waitsen, tn., co. Pest, Hungary, on l. bk. of Danube, 20 m. N. of Budapest; exports wine and cattle. It has some Roman antiquities, and its cathedral dates from 1777. Pop. (1900) 16,808.

Waiver. A person may, by express words, waive or abandon his legal rights, or he may be held to have done so by his conduct. For example, if a new contract is made about the subject matter of an old contract, a breach of the old contract will be waived; and in legal proceedings a person will be held to waive irregularity if he does not immediately take objection to it. But a man must know what his rights are before he can be held to have waived them.

Wake, a festival formerly held in parishes on the anniversary of the dedication of a church to some saint (called in Ireland 'patron day'), attended by merriment, and generally fallen

into disrepute or disuse. A similar watching over a dead body, termed 'lyke' or 'lych-wake,' once common in the Highlands of Scotland and in Ireland, has also passed, or is passing, away as a custom.

Wakefield, munic. and parl. bor. and city, W. Riding, Yorks, England, on the Calder, 9 m. S.S.E. of Leeds. The cathedral is mainly 15th century. On a bridge over the Calder is a chapel founded by Edward IV. Manufactures include worsted yarn and cocoon-matting. The battle of Wakefield was fought in 1460, when the Yorkists were defeated by the Lancastrians. A county hall (W. Riding) was opened in 1898. Pop. (1901), munic. bor. 41,544; parl. bor. 41,189.

Wakefield, tn., Middlesex co., N.E. Massachusetts, U.S.A., 10 m. N. of Boston; has manufactures of stoves, shoes, and rattan. Pop. (1900) 9,290.

Wakefield, EDWARD GIBBON (1796 - 1862), British colonial statesman, born in London. In 1831 he went to Australia to study the problem of transportation on the spot, and developed a plan of systematic colonization. He made it his life's mission after his return to England to convert the public to his views. The fundamental idea of his plan was that the unoccupied lands of a new colony should not be granted promiscuously, but should be portioned out and sold on a regular system at an adequate price. Wakefield accompanied Lord Durham to Canada as a secretary, and remained in that colony till 1845. He afterwards settled in New Zealand, where he died. His chief writing is *A View of the Art of Colonization* (1849).

Wakefield, GILBERT (1756-1801), English controversial writer, was born at Nottingham. He developed Unitarian opinions, and seceded from the Church of England. He was imprisoned for two years (1799-1801) at Dorchester for a libel against Bishop Watson, and was treated as a martyr by his friends, who collected £5,000 for him. He was a somewhat copious author of the keenly controversial type. He wrote his own *Memoirs* (1792); and his correspondence with Fox (1813) contains much that is interesting.

Wakefield Mystery. See TOWNLEY PLAYS and MIRACLE PLAYS.

Wake-Robin, a popular name for *Arum maculatum*, the cuckoo-pint. See ARUM.

Wakley, THOMAS. See LANCET.

Walachia, or WALLACHIA, a former principality of Europe, united in 1861 with Moldavia to form the kingdom of Roumania.

Walajapet, munic. tn., N. Arcot dist., Madras Presidency, India, 19 m. E. of Vellore, with silk and cotton weaving, dyeing and carpet-making. Pop. (1901) 10,067.

Walata, or BIRU, an oasis in the W. Sahara, Africa, about 250 m. N.W. of Timbuktu; has an extensive native trade.

Walch, CHRISTIAN WILHELM FRANZ (1726-84), German theologian, was born at Jena. He was professor of theology at Göttingen in 1757. As an ecclesiastical historian his contributions to literature are of solid worth—*Gedanken von der Geschichte der Glaubenslehre* (1756); *Entwurf einer Historie der Ketzererei, bis auf die Reformation* (11 vols. 1762-85); and *Neueste Religionsgeschichte* (9 vols. 1771-83).

Walch, JOHANN GEORG (1693-1775), German theologian, was father of the above. He was professor of theology at Jena, where he edited the works of Luther in 24 vols. (1740-52), and also drew up a history of the religious questions which had occasioned disputes within the Evangelical-Lutheran Church (5 vols. 1730-9). This was followed by a work in 5 vols. on various controversies outside that church.

Walcheren, isl., Zealand prov., Holland, between mouths of E. and W. Scheldt, covers an area of 52,000 acres, and is fertile, but somewhat unhealthy. Flushing and Middelburg are the chief places. This island was seized by the Walcheren expedition under Lord Chatham in 1809.

Walcheren Expedition was intended, as a diversion in favour of Austria, to destroy the French fleet in the Scheldt and capture Antwerp, which Napoleon was making a great arsenal. An army of some 40,000 men, under Chatham, Pitt's eldest brother, and a fleet under Sir Richard Strachan, left Portsmouth in the end of July 1809. Antwerp, which was weakly held, was reinforced by Bernadotte and King Louis Bonaparte, whilst Chatham took Flushing (Aug. 15) and occupied Walcheren, South Beveland, and Schouwen. Of the troops landed on fever-stricken Walcheren, some 7,000 died, and 15,000 were disabled; and the partial dismantlement of Flushing, evacuated December 23, after the treaty of Schönbrunn, was the only result obtained for twenty millions of money.

Walckendar, CHARLES ATHANASE, BARON (1771-1852), French geographer and man of letters, born in Paris; was prefect of Nièvre (1826-38), and secretary of the Academy of Inscriptions (1840). He wrote biographies of *La Fontaine* (1820), *Horace* (1840), and the *Marquise de Sévigné* (5 vols. 1842-52); *Cosmologie* (1815);

Le Monde Maritime (4 vols. 1818); *Recherche sur la Géographie Ancienne et celle du Moyen-Age* (1822-3); *Nouvelle Collection des Relations de Voyages par Terre et par Mer* (21 vols. 1826-31); *Géographie Ancienne des Gaules* (3 vols. 1839).

Waldeck, or **WALDECK-PYRMONT**, principality of German empire, consists of two principalities—Waldeck, lying between the Prussian provinces of Westphalia and Hesse-Nassau; and Pyrmont, farther to the N.E., between Westphalia, Hanover, the duchy of Brunswick, and the principality of Lippe. The former lies on the watershed between the Rhine and the Weser at altitudes from 2,775 to 1,970 ft.; Pyrmont is almost coincident with the valley of the Emmer, a tributary of the Weser. United area, 433 sq. m.; pop. (1900) 57,918, almost all Protestants. More than 38 per cent. of the surface is covered with forests. Iron is mined. There are mineral springs at Pyrmont and Wildungen. Cap. Arolsen. The principality has one vote in the Imperial Federal Council, and sends one representative to the Imperial Diet. The two principalities were first united in the 13th century. In 1867 the prince resigned most of his sovereign rights to the king of Prussia.

Waldeck-Rousseau, **PIERRE MARIE RENÉ** (1846-1904), French politician, was born at Nantes. In 1879-89 he represented Rennes in the Chamber of Deputies. In 1881 he was made minister of the interior, in Gambetta's cabinet, which post he also held in Jules Ferry's cabinet (1883-5). As member of the Paris bar he defended De Lesseps in the Panama case in 1893. He was a senator in 1894, and in 1899 he formed a coalition cabinet to meet the difficulties attending the rehabilitation of Dreyfus. He resigned in June, 1902, having, by his moderation and firmness done much to restore confidence in republican institutions and respect for lawfully constituted authority. He published *Discours Parlementaires* (1889), *Associations et Congrégations* (1901), *Questions Sociales* (1900), *La Défense Républicaine* (1902), *Politique Française et Étrangère* (1903); and *Action Républicaine et Sociale* (1903).

Waldemar I., THE GREAT (1131-82), king of Denmark (1157). Aided by his great minister, Archbishop Absalon, he raised his kingdom to a high degree of prosperity. Having formed a league against the Wends with Henry the Lion, duke of Saxony, he conquered the island of Rügen (1168-9). He was exceedingly popular with his people, especially with the peasantry.

Waldemar II., THE CONQUEROR (1170-1241), king of Denmark, youngest son of Waldemar the Great, ascended the throne in 1202. His attempts to reduce Sweden and Norway were unsuccessful; but in Germany he acquired Holstein and Mecklenburg, and in 1219 undertook a crusade against the Esthonians, whom he routed at the battle of Arvel, on which occasion the Danish national standard, the Danebrog, is said to have fallen down from heaven in response to the prayers of the Danish bishops. Yet when Waldemar was treacherously seized by Count Henry of Schwerin, and imprisoned for two years, the German princes at once revolted against Waldemar, and defeated him, after his release, at Bornhövede (July 22, 1227). The rest of his reign was devoted to legislation and internal reforms. It was by his order that the code known as *Jyske Lov* (1241), was drawn up.

Waldemar IV., called **ATTERDAG** (d. 1375), king of Denmark, succeeded to the throne in 1340. He sold Esthonia in 1346 to the Teutonic Order, and in 1360 he succeeded in regaining Scania, Halland, and Blekinge from the Swedish king. In 1361 he conquered Gotland, returning to Denmark with the incalculable treasures of Wisby; but this expedition involved him in two ruinous wars with the Hanseatic League and their allies, Sweden and Mecklenburg, during the second of which (1369) his enemies burnt Copenhagen. Peace was finally made at Stralsund (1370).

Waldenses, or **VAUDOIS**, a religious community, whose foundation is to be attributed, on sound historical grounds, to Peter Waldo, a wealthy merchant of Lyons, who in 1170 renounced his possessions and began to wander about as a preacher of voluntary poverty; though certain apologists, in their zeal for the so-called historical continuity of Protestantism from the earliest times, have attempted to trace back the origin of the Waldenses to a period long anterior to the time of Peter Waldo. These claims have, however, been proved to be untenable (see Maitland's *Facts and Documents of the Waldenses*, 1862). After a time the followers of Peter Waldo, known as the 'poor men of Lyons,' established themselves in the valleys of the Cottian Alps, principally on the Italian side, in the valleys of La Pellice, Angrogna, and Chisone, but also in those of Provence and Dauphiné. Their proselytizing zeal, no less than their denunciation of the Church of Rome, their appeal to Scripture instead of the pope, their rejection (at any rate at first) of a def-

inite priestly order, and permission to laymen to administer the Lord's Supper—all these things rendered them particularly obnoxious to the papal see. Pope Lucius III. excommunicated them in 1184, and Pope Innocent III. in 1215, and many perished in the persecution of the Albigenses (1209-29). Nevertheless they continued to increase, and carried their practice and profession (they also repudiated oaths and condemned capital punishment) all over the south of France, and far into the west and south of Germany. They were cruelly persecuted at Strassburg in 1212, at Bingen on the Rhine in 1392, and in the Piedmontese valleys in the times of Popes John XXII. (1316-34), Urban V. (1362-70), and Gregory XI. (1370-8). A war of extermination was begun against them by the Duchess of Savoy in 1475, and in 1487 Pope Innocent VIII. proclaimed a regular crusade against them. In Provence too they were mercilessly persecuted by the French in 1545. Nevertheless they stubbornly held their ground, and in 1551 extorted from the Duke of Savoy the right to freedom of worship in certain of the Piedmontese valleys; and ten years later they formed a 'union of valleys' to safeguard the rights thus extorted. In the following century, however, they suffered fearfully—first from a plague, which in 1630-1 carried off nearly one-half of them; secondly, from the French troops, aided by the Irish Brigade, who in 1655 inflicted upon them such barbarities that the religious consciousness of Europe was aroused and Cromwell intervened, while Milton thundered against their persecutors; and thirdly, from the Duke of Savoy, who in 1686 attempted their forcible conversion to Roman Catholicism, and exiled to Geneva those who proved obdurate. Three years later, however, a heroic band, pining for their native valleys, forced their way back to them under the leadership of their pastor, Henri Arnaud, and successfully withstood the French and Savoyard attempts to crush, convert, or remove them. From the reign of Queen Anne until the annexation of their country to the French republic, the English government paid them an annual subsidy. In 1827 Colonel Beckwith, an English officer mutilated at Waterloo, settled amongst them, married a Waldensian peasant girl, founded over a hundred schools, and remained there until his death (1862). In 1848 Charles Albert of Savoy granted them full religious and political rights. See Gilly's *Visit to the Valleys of*

Piedmont (1823), Comba's *History of the Vaudois in Italy* (Eng. trans. 1889), Preger's *Beiträge zur Geschichte der Walddesier* (1875), and Worsfold's *Valley of Light* (1899).

Walderssee, ALFRED, COUNT VON (1832-1904), Prussian field-marshal, born at Potsdam. He served on the general staff in the Bohemian campaign against Austria (1866); was chief of the general staff of Prince Frederick Charles and the Grand-duke of Mecklenburg during the Franco-German war of 1870-1; succeeded Moltke as chief of the general staff of the German army; was made field-marshal (1895); and was appointed commander-in-chief of the international forces engaged in the suppression of the Boxer insurrection in China (1900).

Waldo. See WALDENSES.
Waldseemüller, or WALTZE-MÜLLER, MARTIN, in Latin HY-LACOMYLUS (1470-1513), German geographer and cartographer, born at Freiburg; spent nearly all his life in Alsace. His best-known work is *Cosmographia Introductio* . . . in super quatuor Americi Vesputii Navigationis (1507), in which the New World is for the first time designated *Amerioi Terra vel America*, although he afterwards acknowledged that America had been discovered by Columbus. See D'Avizac's *Martin Hylacomylus Waldseemüller, ses Ouvrages et ses Collaborateurs* (1867); *Oldest Map with the Name America of the Year 1507*, and the *Carta Marina of the Year 1516*, edited by Fisher and Waiser (1903).

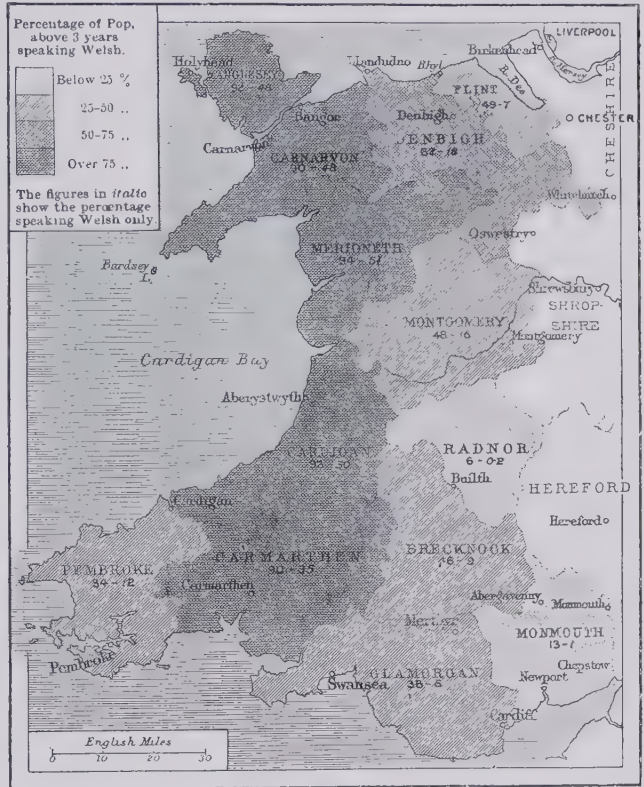
Waldstein, CHARLES (1856), American writer on art and archaeology, born in New York. He became lecturer in classical archaeology in Cambridge, England (1880); director of the Fitzwilliam Museum there (1883-9); director of the American Archaeological School at Athens (1889-93). He made excavations at Plataea, Eretria, and Argos, and was Slade professor of fine art at Cambridge (1895-1901, and 1904). He has written *Essays on the Art of Phidias* (1885), *The Work of John Ruskin* (1894), *The Jewish Question* (1899), *The Ar-give Heraeum* (1902), and *Art in the Nineteenth Century* (1903).

Wales. Geography. — See ENGLAND AND WALES.

History.—The traces of Paleolithic man in Wales are extremely uncertain, but there are numerous remains of the Neolithic Period, especially the dolmens or cromlechs, now regarded by archaeologists as the stony frameworks of ancient tombs from which the earth has been washed away. These are chiefly found in Anglesey, Carnarvon-

shire, Pembrokeshire, and Brecknockshire. Stone implements of the Neolithic Period have also been found. The Bronze Age is represented by numerous specimens of isolated bronze implements and by a few bronze hoards, as well as by cairns and tumuli, containing urns with burnt bones, and sometimes bronze weapons. Formerly the fortresses of unmortared stone found on some of the Welsh mountains were referred to the Bronze Period, but owing to the discovery of pieces

of the Celtic Indo-European tongue. The stream of immigration from the Continent, which began at about 1500 or 1000 B.C., probably never ceased. Gaul came to be occupied by tribes speaking dialects of Celtic different from those of the older settlers; the speech of the continental immigrants into Britain also became modified into that form of Celtic which is the parent. One of the peculiarities of this parent speech was the change of Indo-European *qu* into *p*. About



Wales—Distribution of Welsh-speaking Population.

of iron and of late pre-Roman beads on their original floors (as at Treceiri in Carnarvonshire), archaeologists refer them to the Late Celtic period, about the beginning of the Christian era.

The earliest inhabitants of Wales, who are still largely represented in the present population, especially in S.E. Wales, were probably dark, short, and dolichocephalic. In the Bronze Period these were conquered by a tall, fair, and brachycephalic race, which spoke the parent speech of the Goidelic varieties

a century and a half before our era a powerful army of these later Celts from Belgic Gaul, armed with iron weapons and chariots, invaded Britain, and introduced the typical Late Celtic civilization and art. The Romans conquered Wales under Ostorius Scapula, Suetonius, and Agricola. The last named, according to his son-in-law Tacitus, induced the Britons to make great headway in Roman civilization. Legions were posted to guard the Welsh frontier at Deva (Chester), Uriconium (Wroxeter, near Shrewsbury), and

Isea Silurum (Caerleon-on-Usk). After the firm establishment of Roman rule, in the 1st century A.D., Wales appears to have given the Romans little trouble.

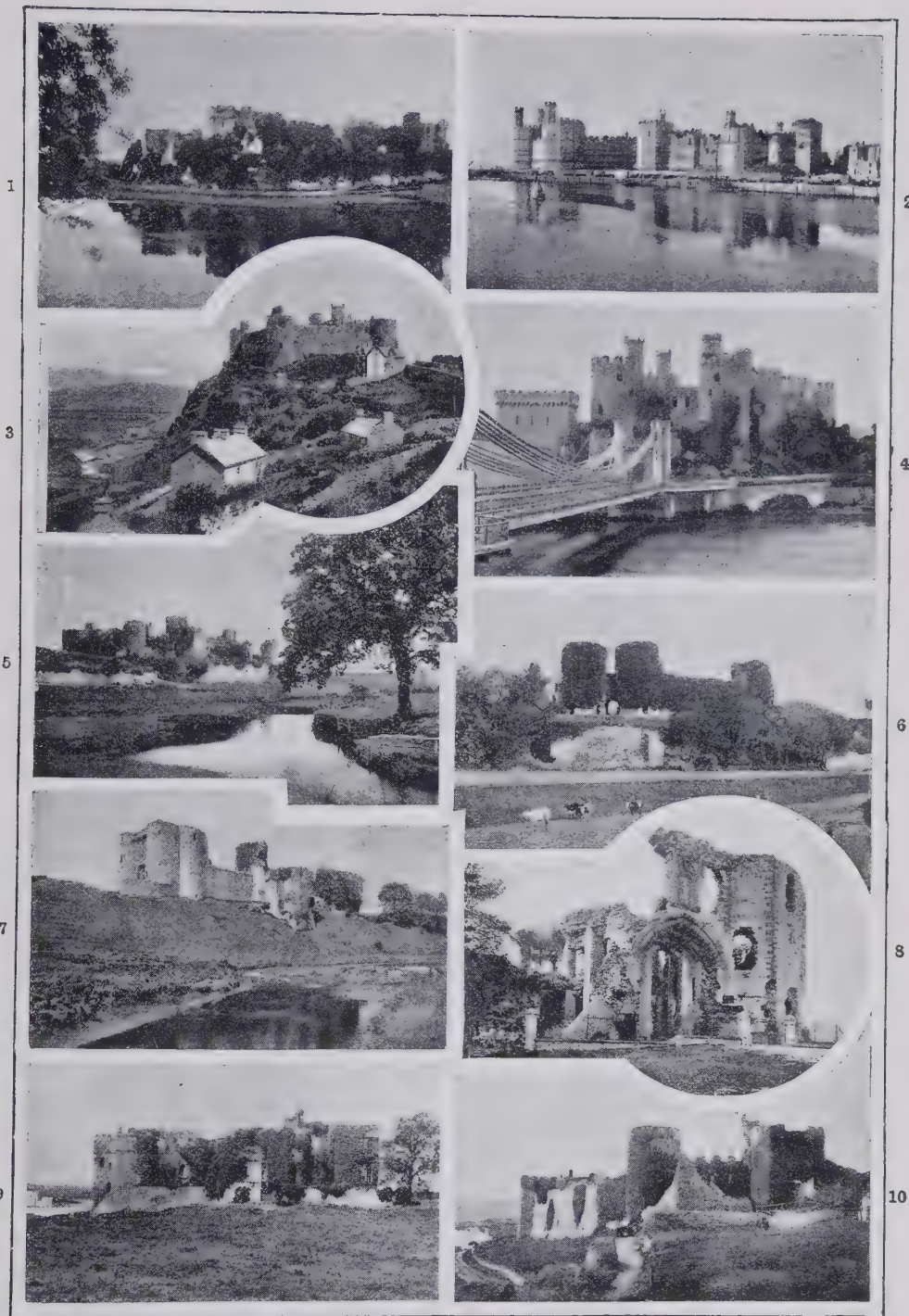
In the 5th century A.D. Cunedda Wledig, from the neighbourhood of Edinburgh, settled in Wales, probably by the invitation of the Welsh chieftains, in order to repel the Irish piratical invaders, and it is from his stock that most of the subsequent rulers of Wales were descended. Many of his descendants, too, became prominent in the ancient British Church, and St. David (Dewi Sant), the patron saint of Wales, was of his family. In the struggle between the Britons and the English one of the chief heroes was Arthur. The name Cymry, by which the Welsh people call themselves, is derived from an older Combroges, meaning men of the same country, and appears to have been adopted by the tribes which held out longest against the English on the west. In 577, by their defeat at Deorham, near Bath, the Welsh were divided from their kinsmen of S.W. Britain; and about 613, by their defeat at Chester, they were separated from the men of Cumbria and Strathclyde. Christianity of the monastic type developed rapidly in Wales in the 5th and 6th centuries, in close conjunction with the churches of Ireland and Brittany. Wales greatly suffered from the ravages of the Danes, but much of her power was restored by Rhodri Mawr (844). The movement, stimulated in W. Europe towards the codification of laws and customs by Charlemagne, led to the formation of the Code of Hywel Dda (or the Good), who died in 949. The next Welsh prince of distinction is Gruffudd ab Llywelyn (d. 1033), a contemporary and opponent of the English king Harold. The succeeding period is chiefly memorable for a long and fierce struggle between the Welsh chieftains, notably of Gwynedd or N. Wales and the Norman barons, who were sometimes aided by the crown. Occasionally, however, the barons were helped, as in the reign of King John, by the Welsh chieftains against the king. The Normans first appeared in Wales, in Glamorganshire, in 1072. The family which ruled in Gwynedd at this time was that of Gruffudd ap Cynan, one of whose descendants, Llywelyn ab Iorwerth (1173-1240), aided the barons in wresting the great charter from King John. Llywelyn ab Gruffudd, his grandson, espoused the cause of Simon de Montfort. It was the support given by the Welsh princes to the barons that led

Edward I. to make a complete conquest of the principality of Wales, thereby consolidating the power of the crown. Prince Llywelyn was killed at Aberedw, near Builth on the Wye, in 1282, and his brother David was executed for high treason in the following year. Edward rendered his conquest of Wales effective by means of a series of magnificent castles, notably those of Conway, Carnarvon, and Harlech. The boroughs of Wales, where English law prevailed, now tended to come into conflict with the men of the country, where Welsh law, with some modifications, was still in force. The friction between the boroughs and the county districts came to a head in the beginning of the 15th century, in the revolt of Owen Glendower, who for a time was practically king of Wales, and was an ally of France. In the wars of the Roses Welshmen played a prominent part on both sides. East Wales was mainly Yorkist, and the west Lancastrian. Finally, after some hesitation, Wales rallied round the Earl of Richmond. Henry VII. took steps to place the boroughs of Wales and the county districts on the same footing by placing them all under English law. Moreover, the institution of the Court of the Star Chamber made the administration of justice a reality. After the accession of Henry VII. the Welsh became devoted adherents of the British crown, and continued so even during the civil war. The development of good government produced the sturdy and independent middle class, which steadily grew in strength, and which is the backbone of Wales to-day. It is the growth of this middle class that has mainly resulted in the great educational movements of modern Wales in university and higher education, as well as in local self-government generally.

Language.—The Welsh language belongs to the Celtic branch of the Indo-European family. The Celtic group stands in closest relationship to the Italic, and like the latter falls into two branches according as *qu* of Indo-European is preserved or is changed into *p*. Irish and Scottish Gaelic and Manx belong to the *qu* group, while to the *p* group belong Welsh, Breton, and Cornish, as did many of the dialects of Gaulish. The *qu* group is sometimes known as the Goidelic, and the *p* group as the Brythonic varieties respectively. In the period of the Roman occupation the Celtic languages were inflected. The loss of inflections has led, as in the Romance languages, to correlative changes in word order and syntax. As distinguished

from the languages of the *qu* group, those of the *p* group reveal far more linguistic changes, due to levelling, new formations, change of accentuation, and similar linguistic variations of mental origin; while the languages of the *qu* group have been modified mainly by the processes of purely phonetic change. Wales has three main dialects—(1) that of Gwynedd (Anglesey and Carnarvonshire), which is probably an outcrop of the old British of N. Britain; (2) the Powysian, or that of Mid-Wales, probably a similar outcrop of the dialect of Mid-Britain; and (3) the southern, in two subvarieties—that of the S.E. or Gwentian, and that of the S.W. or Dimetian, which is an outcrop on the N. coast of the Bristol Channel of southern British, just as Cornish is the extreme of the outcrop on the southern side. Breton also appears to be a branch of the same old British dialect transferred to French soil. The literary language of Wales is common to the whole principality, and has been so from at any rate post-Roman times. Its earliest extant remains are glosses on Ovid's *Art of Love*; glosses on a small tractate on weights and measures; glosses in a MS. of Juvenius in the Cambridge University Library, together with some Welsh verses of the same period; and glosses on Martianus Capella. These glosses belong to about the 9th century, some of them possibly earlier.

Literature.—With a few important exceptions, the chief original works of Welsh literature are in poetry, and these are often of striking excellence. The oldest specimen of Welsh poetry is a series of stanzas from two different poems in the Juvenius Codex of the University Library, Cambridge, belonging to the 9th century; but probably certain verses found in later MSS. of similar style belong to the same period. The *Book of Aneirin* (early 13th century) has preserved in parts the orthography of the MS. from which it was copied, and gives us specimens of poetry which may well belong to the 8th or 9th century. The main poem of this MS. is called *Y Gododin*, but it is in its present form an irregular assortment of fragments from two or more poems describing contests in N. Britain, especially the battle of Cattraeth. The main hero is Cynon ab Clydno Eiddin, a member of the family of Cynfarch, to which Urien Rheged also belonged. There are poems of the same cycle in the *Book of Taliessin* (14th century). Two chief zones existed for this poetry—namely, Gwynedd and Powys. The *Book of Aneirin* and the



Historic Castles in Wales.

1. Pembroke. 2. Carnarvon. 3. Harlech. 4. Conway. 5. Caerphilly. 6. Rhyddlan. 7. Kidwelly. 8. Denbigh: the keep.
9. Carew. 10. Manorbier. (Photos by Frith.)

oldest nucleus of the *Book of Taliessin*, together with certain poems of the *Black Book of Carmarthen* (12th century), belong to the former; while other poems of the *Black Book of Carmarthen*, and most of the Llywarch Hên poems of the *Red Book of Hergest*, belong to the latter. In the *Book of Taliessin*, and sporadically in other books, there is a great deal of poetry which reflects the monastic studies of the early middle ages and the ideas of poetry then prevalent. From 1100-1300 Welsh poetry is represented mainly by the compositions of the court poets, Meilir, Gwalchmai, Cynddelw, Dafydd Benfras, Llywarch ab Llywelyn, Gruffydd ab yr Ynad Coch, and others. These poems exhibit great vigour and terseness of expression, and highly developed technical skill. Towards the end of the period poetry in praise of women begins to be developed, especially by an Anglesey poet, Gruffudd ab Maredudd. This type of poetry appears to have been cultivated further by Gruffydd Gryg, an older contemporary of the greatest love poet of Wales, and one of the greatest in all literature, Dafydd ab Gwilym. The latter developed love poetry to a very high degree of perfection, but the chief characteristic of the poems is a consummate blending of the poetry of love with that of nature. In this direction Dafydd ab Gwilym found a host of imitators among later poets. The more ascetic side of Welsh life found its poetic expression in the 14th century in Sion Cent. Welsh poetry was linked with political movements by Iolo Goch, the friend of Owen Glendower, Gutto'r Glyn, Lewis Glyn Cothi, and Ieuan Deulwyn. The leading families of Wales were cordial patrons of the poets. Tudur Aled was the last pre-reformation poet of distinction. His chief successor in the Tudor period was William Lleyn. During the civil war and the period of the commonwealth the leading poet was Hugh Morris, a writer of love poetry. Towards the middle of the 18th century a great revival of Welsh poetry took place through the efforts of writers of great poetic gifts, such as Goronwy Owen, who had studied at the English universities, and who were familiar with classical models. Since that time a large number of poetic writers have given striking and characteristic expression to the various phases of Welsh life. The Welsh language is especially rich in hymns of striking beauty, written by Williams of Pantycelyn (author of *Guide me, O Thou great Jehovah*) and others. In prose the chief mediæval work is the volume

of legends called *Y Mabinogion* (trans. by Lady Guest, 1838). There are extant many MSS. containing translations from French and Latin, notably stories of the Charlemagne cycle. The whole Bible was translated into Welsh from Hebrew and Greek in 1588 by Dr. Morgan, bishop of St. Asaph, and revised by Bishop Parry and Dr. John Davies in 1620. The translation of the Bible was followed by a succession of translations of devotional and theological works into Welsh. One of the most remarkable Welsh books of the 17th century is *Llyfr y Tri Aderyn* ('Book of the Three Birds'), by Morgan Lloyd, a prominent Welsh Puritan and follower of Jacob Böhme. The chief development of Welsh prose has been in the 19th century, when a large number of excellent works on theology, biography, general literature, politics, as well as works of fiction, were published.

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Wales, CALVINISTIC METHODIST, OR PRESBYTERIAN CHURCH IN. The Welsh Presbyterian Church, or as it is better known the Calvinistic Methodist Church, while in reality the outcome of the preaching of Howell Harris and George Whitefield, was practically brought into organic being by the Rev. Thomas Charles (1735-1814). About half a century before his time Methodism had obtained a firm hold in Wales; but it was not at any time identified with English Methodism, being Calvinistic in its tenor. On Charles's secession from the Established Church he joined the Welsh Methodists, and about 1790-1 the practical organization of the body as a distinct church commenced. The form of government is now practically that of the Presby-

terian Church. Each congregation directs its own affairs, and the church courts consist of a general assembly (which met first in 1864, and is the ultimate court of appeal), quarterly meetings of more restricted jurisdiction, and monthly county meetings. There are two principal colleges of the denomination—that of Bala, founded in 1837; and that of Trevecca, founded by Lady Huntington in 1769. There are 1,386 churches, besides chapels, etc.; 1,262 ministers and preachers; and close upon 170,000 communicants. The revenue of the church in 1904 amounted to about £354,000.

Wales, PRINCE OF, the title borne by the eldest son and heir-apparent of the reigning sovereign of England since the conquest of Wales by Edward I. The title was first bestowed upon an English prince in the person of Edward (II.) in 1301, and has been regularly borne by the eldest son of the sovereign since it was granted to Edward the Black Prince. It is not, however, hereditary, but is in each case a fresh creation. The distinguishing badge of the Prince of Wales is the plume of three ostrich feathers, with the motto *Ich dien*.

Wales, UNIVERSITY OF, was founded in 1893, and comprises the university colleges of Aberystwith, Bangor, and Cardiff. Its faculties are arts, science, and medicine; and it has departments in law, music, applied sciences, and teaching. Students must reside either in the halls or in licensed lodgings. In connection with University College, Aberystwith (founded 1871), there is a men's hostel, and for women there is the Alexandra Hall. In connection with University College, Bangor (founded 1884), is University Hall, for women (opened in 1897); and with University College, Cardiff (founded 1882), Aberdare Hall, also for women.

Walewski, ALEXANDRE FLO-RIAN JOSEPH COLONNA, COMTE (1810-68), French diplomatist, born at Walewica in Poland, was the son of Napoleon I. and the Polish Countess Walewska. He founded the journal *Le Messager*, which Thiers afterwards acquired, sending (1840) its founder on a mission to Egypt, and afterwards to Uruguay and Argentina. He was next minister successively at Florence (1849), Naples (1850), Madrid (1851), and London (1851). He was minister of foreign affairs (1855-60), and presided at the Congress of Paris (1856). He wrote *Mot sur la Question d'Afrique* (1837), *L'Alliance Anglaise* (1838), and a comedy, *L'Ecole du Monde* (1840).



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The University of Wales.

1. Alexandra Hall, Aberystwith. (Photo by Gyde.) 2. University Hall, Bangor. (Photo by Mills.) 3. Aberystwith College. (Photo by Frith.)
4. University College, Bangor. (Photo by Frith.) 5. Aberdare Hall, Cardiff. (Photo by Freke.) 6. University College, Cardiff. (Photo by Frith.)

Walfish Bay, a bay and British enclave in German S.W. Africa. The bay is the only natural harbour between Angola and the Orange R. The land possession consists of a peninsula and a stretch of sandy territory covering an area of some 430 sq. m. It has been a dependency of Cape Colony since 1884. Pop. 1,015 (870 being coloured).

Walhalla. See VALHALLA.

Walker, CLEMENT (d. 1651), was born in Dorsetshire; became M.P. for Wells in 1640, espousing the parliamentary side in the struggle against the king, and was associated with Prynne in the composition of topical pamphlets about the conduct of the war. Although he denies, in his *History of Independency* (1646-61), that he favoured the Presbyterians, he bitterly hated the Independents; was expelled from the house in Pride's Purge (1648), and was committed by Cromwell (in consequence of the publication of the *History of Independency*) to the Tower in 1649, where he remained till his death.

Walker, FRANCIS AMASA (1840-97), American economist, born at Boston. From 1873 to 1881 he was professor of political economy at Yale, and afterwards president of the Massachusetts Institute of Technology. An advocate of the Ricardian view of rent, of international bimetalism, and of scientific education, he wrote *The Wages Question* (1876), in which he definitely exploded the theory of a 'fixed-wages fund'; *Money* (1878); *Land and its Rent* (1883); *Political Economy* (1883-4); *The Making of the Nation* (1893); *General Hancock* (1894); and *International Bimetalism* (1896).

Walker, FREDERICK (1840-75), English landscape and genre painter, born in London. He has been called the 'creator of the English renaissance'; it was he who saw the possibility of combining the grace of the antique with the realism of everyday life. His poetic vision, dignity of design, and quiet colour harmonies have influenced many younger men. He worked in an architect's office, joined the Academy schools in 1858, and designed woodcuts for illustrating Thackeray's *Philip*. His *Harbour of Refuge* and *Vagrants* are in the Tate Gallery, London. See J. G. Marks's *Life and Letters of Frederick Walker* (1896); Claude Phillips's monograph in the *Portfolio* (June 1894); J. Comyns Carr's *Frederick Walker* (1885).

Walker, GEORGE (1618-90), defender of Londonderry, was born in Tyrone. In 1669 he was appointed to the parish of Lissan in Londonderry, and in 1674 to Donaghmore, near Dungannon.

On the outbreak of the revolution he raised a regiment for the defence of Londonderry, and acted with it through the siege, which lasted from April till August 1689, the citizens being upheld by the heroic spirit of Walker. He was created bishop of Londonderry, but was killed at the battle of the Boyne. He published *A True Account of the Siege* (1689).

Walker, JOHN (1674-1747), English author, famous in the days of the politico-religious contests between the Anglican and Puritan parties. His book, *An Account of the Sufferings of the Clergy who were Sequestered in the Grand Rebellion* (1714), excited much controversy. Walker was a native of Exeter, and rector of St. Mary-the-More, Exeter.

Walker, JOHN (1732-1807), English actor and lexicographer, born at Colney Hatch in Middlesex. He early took to the stage, and belonged to Garrick's company; but in 1768 he quitted the stage to open a school for elocution. His *Critical Pronouncing Dictionary* (1791) was for many years a standard work. He also published *A Rhyming Dictionary* (1775), and books on elocution, rhetoric, and composition.

Walker, JOHN (1770-1831), English antiquary, was born in London; became fellow of New College, Oxford (1797). In 1819 he was appointed vicar of Hornechurch in Essex. He edited *Selections of Curious Articles from the Gentleman's Magazine* (1809); and published *Oxoniana* (1809), *Letters Written by Eminent Persons from Originals in the Bodleian* (1813), and *Curia Oxoniensis* (1826). He was the first editor of the *Oxford University Calendar* (1810).

Walker, JOHN (?1781-1859), English inventor, was born at Stockton-on-Tees, and became a chemist (1818). He, almost by accident, invented friction matches. The honour of the discovery is, however, claimed for Isaac Holden, who arrived independently at the same solution in 1829.

Walker, THOMAS (1784-1836), English magistrate, was born in Manchester, and was called to the bar (1812). He devoted special attention to the problems of pauperism, and published *Observations on . . . Pauperism* (1831) and *Suggestions for . . . Reform in Parochial Government* (1834). In 1829 he became a police magistrate in London. In 1835 he began the publication of the weekly periodical *The Original*, on which his fame rests. He also wrote admirable papers on health and gastronomy.

Walker, WILLIAM (1824-60), American adventurer, born in Nashville, Tennessee. He be-

came a newspaper editor in New Orleans, and later in San Francisco. He led a filibustering expedition into N. Mexico in 1853, which was a failure; but Walker was invited to intervene in the affairs of Nicaragua, and on the death (1855) of Castillon became general-in-chief of the army, and finally president of Nicaragua. But at length Walker found himself obliged to surrender (1860) to the captain of the British man-of-war *Icarus* in order to avoid capture. The British authorities, however, handed him over to his enemies, and he was shot. See Oliphant's *Patriots and Filibusters* (1860); J. Miller's poem, *With Walker in Nicaragua* (1873); the picturesque but mainly historical descriptions in Boyle's novel, *Fools of Fortune* (1876); Doubleday's *Reminiscences* (1886); and Roche's *Story of the Filibusters* (1891).

Walker, WILLIAM SIDNEY (1795-1846), Welsh Shakespearean critic, was born at Pembroke. He became fellow of Trinity College, Cambridge, but on account of his theological opinions had to resign. He moved to London in 1831, and his mind became unbinged. Of his voluminous MSS. two volumes were published as *Shakespeare's Versification* (1854), and *A Critical Examination of Shakespeare's Text* (1860). See *Memoir by Moultrie*, prefixed to Walker's *Poetical Remains* (1852).

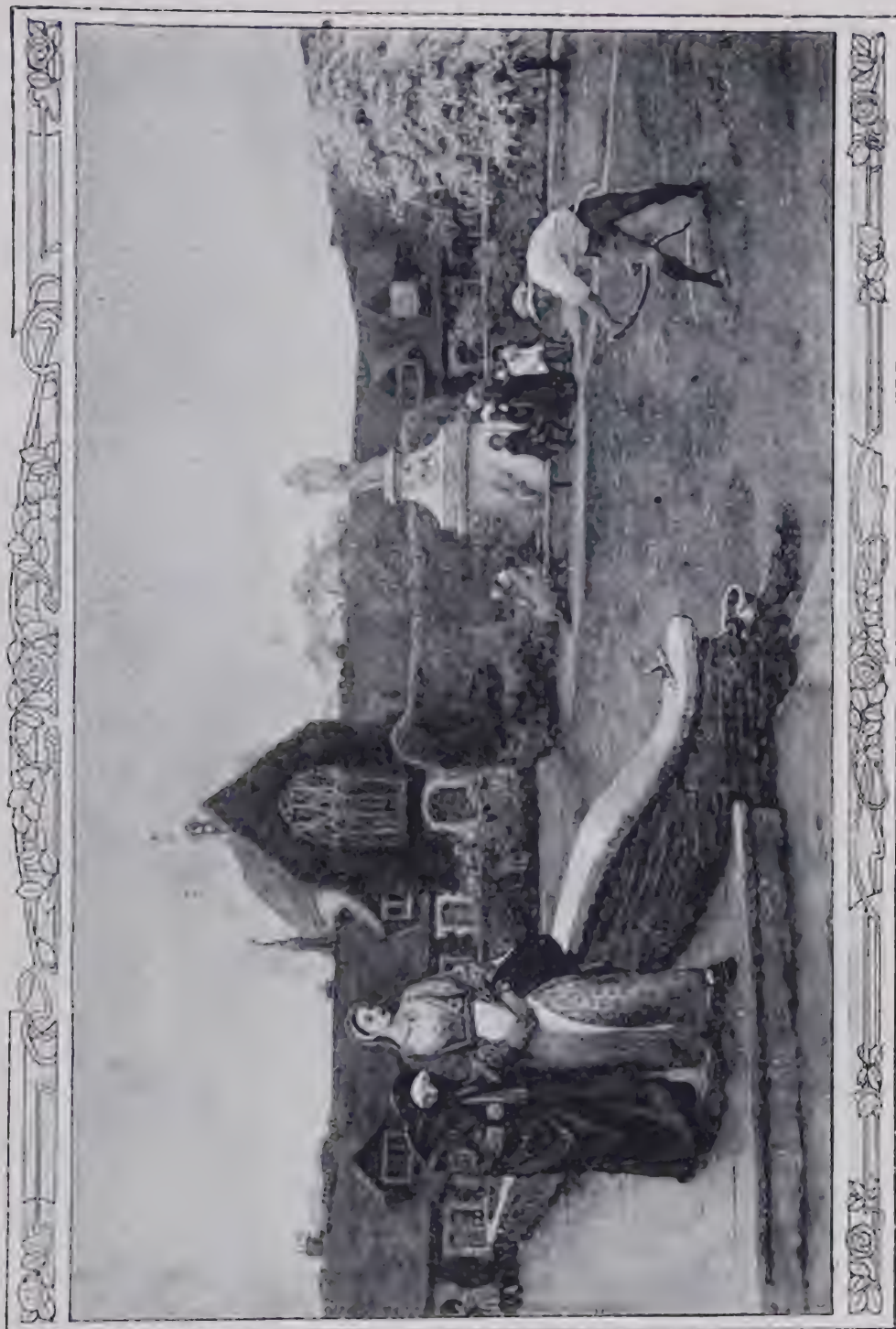
Walking. See ATHLETIC SPORTS.

Walking Leaf. See LEAF INSECTS.



Walking-stick Insect.

Walking-stick Insects, or STICK INSECTS, are, like the leaf insects, orthopterous insects belonging to the family Phasmodae. The body is greatly elongated,



A Painting by Fred Walker—'The Harbour of Refuge.'
(Copyright of Messrs. Francis Ellis and W. Hayward.)

and is very slender, giving the insect a resemblance to a piece of stick, while the wings are either absent, or when present are leaf-like. An example is *Lonchodes nematodes*, from the Malay Archipelago. Stick insects are vegetarian in diet. See LEAF INSECTS.

first portions of it were built about 326 B.C. as a defence against the Hiung-nu; but it owes its design as a whole to Shih-huang-ti, of the Chin dynasty, who constructed it in ten years (214-204 B.C.). An inner wall, embracing the basin of the Sang-kau R., was

top, and a height of from 15 to 30 ft.

Wallaby. See KANGAROO.

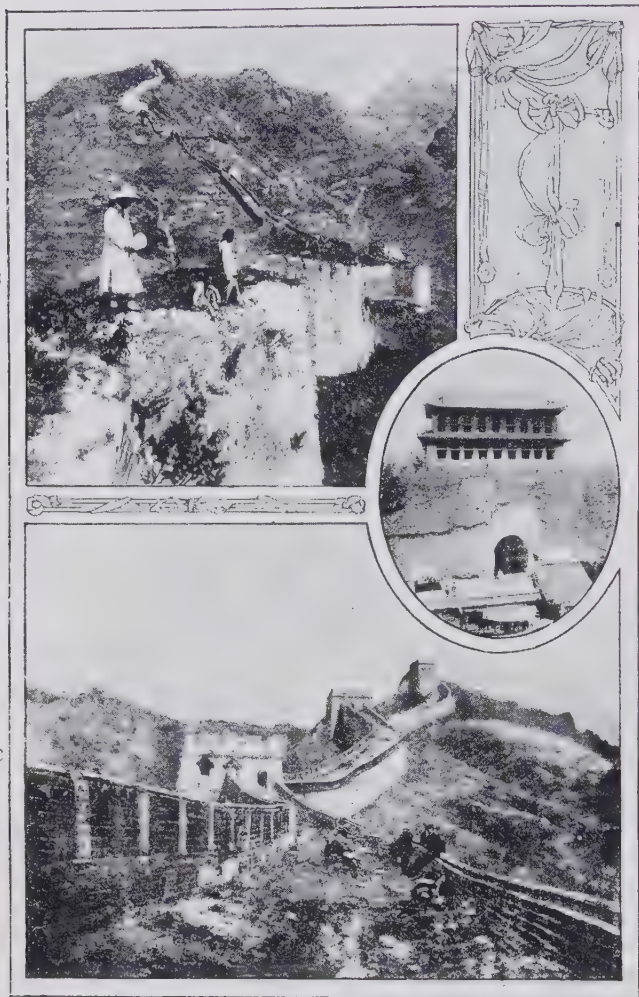
Wallace, ALFRED RUSSEL (1823), English traveller and biologist, was born at Usk in Monmouthshire; spent four years (1848-52) collecting in the Amazon region, and then (1854-62) in the Malay Archipelago, and published *Travels on the Amazon* (1853), and *The Malay Archipelago* (1869), perhaps the most interesting of his books. While in the East, Wallace, quite independently of Darwin, thought out a theory practically identical with the theory of natural selection, and sent home his paper to Darwin while unaware of the latter's work. Wallace's views are set forth in *Contributions to the Theory of Natural Selection*



Alfred Russel Wallace.
(Photo by London Stereoscopic Co.)

(1870), and in *Darwinism* (1889), a final summing up of his views. In *Darwinism* he gives up Darwin's supplementary theory of sexual selection, and expresses the opinion that natural selection does not account for the development of the higher qualities of man. His interest in the geographical distribution of animals is shown in a monograph (1876) which marks an epoch in the development of the subject. (See also *Island Life*, 1880.) The breadth of his interests is proved by such works as *Land Nationalization* (1882), *Vaccination* (1885), *Miracles and Modern Spiritualism* (1875), *The Wonderful Century* (1899), and *Man's Place in the Universe* (1903). See also his autobiographical work, *My Life* (1905).

Wallace, SIR DONALD MACKENZIE (1841), English author and traveller, was private secre-



The Great Wall of China.

1. The Wall crossing the mountains at Shan-hai-kwan. 2. Entrance through the Wall at Shan-hai-kwan. (Photos by Underwood & Underwood.) 3. The top of the Wall. (Photo by Frith.)

Walking-Sticks, a term satirically applied to candidates for the House of Commons nominated by political associations, and subject to them in their parliamentary votes (1878).

Wall, GREAT, OF CHINA, extends from about 98° to 120° E. longitude, and its length must considerably exceed 1,500 m. The

built during the Ming dynasty, and a branch extends for some distance along the border of Chili and Shan-si. Dr. Williams (*Middle Kingdom*) describes the eastern portion as composed of earth and pebbles faced with large bricks, supported on a base of stone, with a width of 25 ft. at the foot and 15 ft. at the

tary to the Marquess of Dufferin and to the Marquess of Lansdowne as viceroys of India (1884-9); was political officer attached to the Czarevitch during his Indian tour (1900-1); and was director of the foreign department of the *Times* (1891-9). He was a principal editor of the tenth edition of the *Encyclopædia Britannica*, and his published works include *Russia* (new ed. 1905), *Egypt and the Egyptian Question* (1883), and *The Web of Empire* (1902).

Wallace, Lewis [Lew] (1827-1905), American soldier and author, served in the Mexican war; and on the outbreak of the civil war joined the Federal army as a volunteer. From 1878-81 he served as governor of New Mexico, and from 1881-5 as United States minister at Constantinople. His romance, *Ben-Hur* (1880), achieved wide popularity; his other works include *The Fair God, or the Last of the Tzins* (1873), *The Prince of India* (1893), *The Wooing of Malkatoon* (1898), and a biography of President Harrison (1888).

Wallace, Sir Richard (1818-90), English collector of works of art, a natural son of Maria, *née* Fagnani, Marchioness of Hertford. He was brought up chiefly in Paris. He sold his own collections in 1857, but devoted himself to the formation of a more extensive collection for his half-brother, the fourth Marquis of Hertford, which in 1870 was left to him by will. This great collection his widow bequeathed to the nation in 1897, which acquired Hertford House, London, to serve as a museum. For services during the siege of Paris to British subjects he was created a baronet, and he sat (1873-85) as M.P. for Lisburn.

Wallace, Robert (1831-99), Scottish theologian, journalist, and politician, born near Cupar, Fife. He became a Presbyterian minister at Edinburgh (1860-76) —Trinity College Church and Old Greyfriars'. He was accused of heresy as author of *Church Tendencies in Scotland* (1870), but obtained the chair of church history at Edinburgh (1872). Leaving the ministry (1876), he succeeded Russel as editor of the *Scotsman* till his resignation (1880). In 1886 he became M.P. for E. Edinburgh, defeating Mr. Goschen. Though a Gladstonian, he delivered a deadly criticism of the Home Rule Bill. He fell down in a fit whilst about to address the house (June 5), and never revived. His writings treat of reform of the Church of Scotland, ecclesiastical history in relation to theology, and the life of George Buchanan (1899). See *Life and Last Leaves* (1903), by Smith and Wallace.

(8)

Wallace, Sir William (?1722-1305), Scottish hero and patriot, son of Sir Malcolm Wallace, of Elderslie in Renfrewshire. Having killed the son of the governor of Dundee Castle, in revenge for an insult, he fled to the mountains. Possessing great strength, undaunted courage, and military skill, as well as a warm attachment to his native country, he resolved to liberate Scotland from the English yoke. After capturing Aberdeen, Forfar, and other towns, he was engaged in the siege of Dundee, when news came of the advance of a large English army towards Stirling.



Wallace Monument, Stirling.

(Photo by Frith.)

He immediately marched to meet the enemy, gained a signal victory over them at Stirling Bridge (1297), and, entering England, ravaged the north of the country. Wallace was at once proclaimed 'governor of Scotland in the name of King John,' John Baliol being then a captive in England. The English monarch led north, in person, an army of 80,000 men, and Wallace was defeated at Falkirk (1298). He continued a desultory warfare, until Edward obtained possession of him, through the treachery of a Scottish nobleman, Sir John Menteith. Wallace was brought to London, and was executed at Smithfield

under circumstances of great barbarity (1305). His achievements have been a favourite theme with Scottish poets, and have been especially celebrated by Henry the Minstrel, sometimes called Blind Harry. See Carrick's *Life of William Wallace* (1830), Watson's *The Story of William Wallace* (1862), and Rogers's *The Book of Wallace* (1889).

Wallace, William (1844-97), Scottish philosopher, was born at Cupar, Fife. In 1868 he became fellow and tutor at Merton College, Oxford, and in 1882 Whyte professor of moral philosophy. He published *The Logic*

of Hegel (1873 and 1892); *Hegel's Philosophy of Mind, Lectures and Essays on Natural Theology* (1898); and *Epicureanism* (1880); *Kant* (1882); *Schopenhauer* (1890).

Wallace, William Vincent (1814-65), Irish musical composer, was born at Waterford. After acting as leader of an orchestra in Dublin, he went to Australia in search of health, but returned in 1845 to bring out his first opera, *Maritana*, which attained an immediate and lasting success. Among his subsequent operas were *Matilda of Hungary* (1847), *Lurline* (1860), *The Amber Witch* (1861), *The Desert Flower* (1863), and an unfinished work *Estrella*.

Wallace's Line, a biological boundary line passing N.N.E. between the E. Indian islands of Bali and Lombok and Borneo and Celebes, to the west of which the flora and fauna are distinctly Asian in character, while to the east and south the Australasian elements begin to be marked, and very soon become predominant. It was named after the biologist Wallace, who clearly defines its course in his *Island Life* (1880).

Wallack, JAMES WILLIAM (?1791-1864), English actor, born in London. After some years at Drury Lane, where he supported Elliston and Kean, he appeared in New York, and subsequently divided his career between England and America, where he died. He built Wallack's Theatre in New York in 1861. His chief successes were made in melodrama and comedy, though he attempted most of the more prominent Shakespearean parts. His son, known as Lester Wallack (1819-88), enjoyed a successful career, also as an actor, in America.

Wallaroo, seapt. tn., S. Australia, 91 m. N.W. by N. of Adelaide, near shore of Spencer's Gulf; has copper mines and smelting works. Pop. (1901) 3,500.

Wallawalla, city, Washington, U.S.A., co. seat of Wallawalla co., 210 m. E.N.E. of Portland, Oregon; with flour mills and iron works. Pop. (1900) 10,049.

Wallenstein, or **WALDSTEIN**, ALBRECHT WENZEL EUSEBIUS VON (1583-1634), imperialist general, was born at Hermanic in Bohemia. He first distinguished himself in a campaign against Venice. When Bohemia became strongly Protestant, and elected as its king Frederick, Count Palatine, Wallenstein lost his estates. On the overthrow of Frederick, Wallenstein was amply rewarded with confiscated lands in Bohemia, and in 1623 was created Prince of Friedland. In 1625, when Christian IV., king of Denmark, headed a northern Protestant league in opposition to the imperialist cause, the Emperor Ferdinand eagerly accepted the service which Wallenstein offered to him. Hitherto Ferdinand had employed the army of the Catholic League under Maximilian of Bavaria, whose general was the famous Tilly. The object of Maximilian was the restoration of Roman Catholicism in Germany and the diminution of the emperor's influence. The object of Wallenstein was the restoration of the imperial power and the formation of a vast centralized Hapsburg empire, which should include all Germany, and should dominate the Baltic. Wallenstein's appearance at the head of a strong force was fol-

lowed by successes over Mansfeld and Bethlen Gabcr, two other Protestant opponents of adventurous natures. He then attempted to secure the Baltic seaboard, and in May 1628 besieged Stralsund. Stralsund, however, defied all his efforts, and Tilly was unable to take Glückstadt. In June 1630 Gustavus Adolphus landed in N. Germany, and in July Wallenstein, at the emperor's request, resigned his command. The emperor's suicidal action was caused by the jealousy of the princes of the empire of Wallenstein in the diet which met at Ratisbon in June 1630, and was encouraged by the intrigues of Richelieu. The overwhelming successes of Gustavus forced Ferdinand again to have recourse to Wallenstein, who in 1632, accepting command on his own terms, raised a fresh army. After defeating Tilly on the Lech, Gustavus found himself confronted by Wallenstein. The battle of Lützen, on November 1632, was lost by Wallenstein, though the death of Gustavus was a compensating fact. After invading Silesia, Wallenstein once more incurred the jealousy of Maximilian of Bavaria and the Catholic princes. He then tried to win over his officers to resist all attempts to effect his disgrace. In this he failed, and on Feb. 24, 1634, he was assassinated by some Irish and Scottish officers. He was one of the great figures of the Thirty Years' war, and was a man of transcendent ability, but unscrupulous. See Ranke's *Wallenstein* (ed. 1880); Förster's *Wallenstein as Reigning Sovereign and Landed Proprietor* (1834).

Waller, EDMUND (1606-87), English poet, born at Colleshill, Bucks; was in 1622 admitted a member of Lincoln's Inn. He was elected M.P. in the following year. In 1643 he was one of the commissioners appointed to treat with the king at Oxford. Shortly afterwards 'Waller's plot,' the aim of which was to hold London for the king, was discovered. His life was spared, but he was fined £10,000 and exiled (November 1644). He retired to France, and published his first volume of poems (1645). The sentence of banishment was revoked in 1651, and in 1655 he was made a commissioner of trade. In 1654 he acknowledged Cromwell's favour by *A Panegyric to My Lord Protector*, and later wrote a poem, *Upon the Death of the Lord Protector*; but at the restoration he produced a poem, *To the King on his Majesty's Happy Return*. In 1661 he became M.P. for Hastings, and continued to sit in Parliament till his death. In 1685 he published his *Divine Love*, his longest poem. Waller was one

of the founders of the classical school of poetry, and helped to mould the heroic couplet in the form which Dryden and Pope were to perfect. His reputation rests chiefly on his lyrics, such as *Go, Lovely Rose*, and *On a Girdle*. His *Works* were edited by Fenton (1729), and by Thorn Drury (1893); and his *Poems* by Thorn Drury (1905). See *Life* by Stockdale (1772) and Dr. Johnson.

Waller, LEWIS (1860), English actor, born at Bilbao in Spain; made his first appearance on the stage at Toocie's Theatre, London, in *Uncle Dick's Darling* (1883). In 1895 he leased the Haymarket Theatre, London, when he produced Oscar Wilde's *An Ideal Husband*. His chief appearances, however, on the boards have been in Shakespearean characters, among them Brutus in *Julius Caesar*, the Bastard in *King John*, and the title rôle in *Henry V.* perhaps his greatest impersonation.

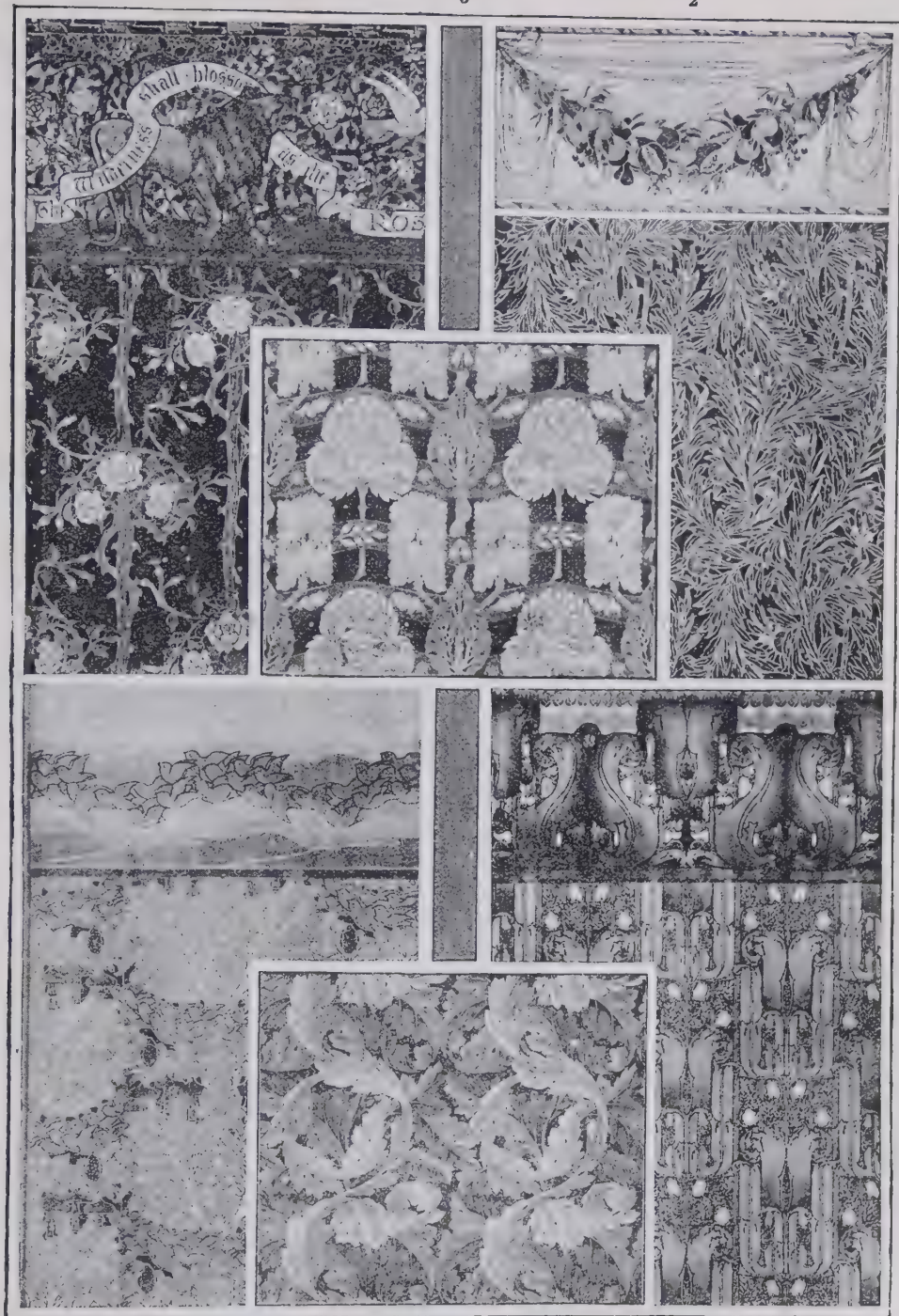
Wallflower. See CHEIRANTHUS.

Wallerin, JOHAN OLOF (1779-1839), Swedish poet and divine, born in Dalecarlia; in 1800 won the Academy's prize for the didactic poem *Uppfostraren*; elected (1810) a member of the Academy; and soon after appointed one of the committee for revising the church hymn book, to which he contributed some most beautiful hymns. He was also the most eloquent preacher the Swedish Church has ever possessed. In 1837 he was nominated archbishop of Upsala. His works appeared as *Samlade Vitterhetsarbeten* (1878).

Wallingford, munic. bor. and mkt. tn., Berkshire, England, on the Thames, here crossed by a fine bridge (1890), 15 m. N.W. of Reading. It was strongly fortified by the Romans. In 1006 it was burnt by the Danes, but was soon rebuilt. Its castle was demolished in 1653. In Leland's time there were fourteen parish churches, of which only three now remain—St. Mary, St. Leonard, and St. Peter. The last-named contains the tomb of Sir William Blackstone of legal fame (d. 1780). The town hall dates from 1670; the corn exchange is a modern building. The Kine Croft, now a recreation ground, is partly enclosed by ancient earthworks. Pop. (1901) 2,808.

Wallingford, tn., New Haven co., Connecticut, U.S.A., 12 m. by rail N.N.E. of New Haven; is the seat of the Wallingford community. The manufactures include silver, nickel, britannia, brass, and plated ware. Pop. (1900) 6,737.

Wallis, JOHN (1616-1703), English mathematician, was born at Ashford, Kent, and in 1648 was



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Modern Wall-Paper Designs.

1. 'Lion' frieze and 'Rosebush' filling, by Walter Crane. (Jeffrey & Co.) 2. 'Orange tree' paper and 'fruit' frieze, by Walter Crane. (Jeffrey & Co.) 3. 'Oak and ash and bonnie ivy-bush,' by Heywood Sumner. (Jeffrey & Co.) 4. 'Fairyland' design, by C. F. A. Voysey. (Essex & Co.) 5. 'Walden' design, by Illingworth Kay; printed and stencilled. (Essex & Co.) 6. 'Acanthus' design, by William Morris. (W. Morris & Co.)

appointed Savilian professor of geometry at Oxford. He was one of the founders of the Royal Society, and acted as one of the secretaries of the Westminster Assembly. He was a strong Parliament man, but after the death of Cromwell favoured the restoration. His chief work is *Arithmetica Infinitorum* (1655). His *Works* were published in 1791.

Wallon, ALEXANDRE HENRI (1812-1904), French historian and statesman, was born at Valenciennes. He succeeded Guizot at the Sorbonne in 1850 as lecturer on history and geography. In 1860 he obtained the Gobert prize of the French Academy for an essay on Joan of Arc. He was a member of the National Assembly in 1849, minister of education 1875-6, and represented the department of the Nord after the fall of the empire. In 1850 he was elected member of the Academy of Inscriptions, and in 1873 became its perpetual secretary. He wrote *Richard II.* (1864), *La Terreur* (1873), *Saint Louis et son Temps* (1875; 3rd ed. 1887), *Histoire du Tribunal Révolutionnaire de Paris* (6 vols. 1880-2), and *Les Représentants du Peuple en Mission*, etc. (5 vols. 1888-90).

Walloons, the inhabitants of south-east Belgium, are Celts, direct descendants of the Gaulish Belgæ. A line drawn from near St. Omer, through Central Belgium, to Maestricht roughly separates the Flemish lowlanders from the Walloons of the uplands, who in 1900 numbered 2,575,000 of exclusive Walloon speech, besides 800,000 bilingual (Walloon and Flemish). The Walloons—i.e., "Welsh" or "Foreigners"—are physically distinguished from the Flemings by their darker colour, taller stature, stronger and more angular frames. The Walloon language is a North French dialect, independently developed, but showing marked affinities to the *patois* of Picardy and Lorraine. See Chavée's *Français et Wallon* (1837), E. Réclus's *Universal Geography* (Eng. trans. vol. iii.).

Wall-paper, the modern substitute for tapestry, stamped leather, and other mural hangings, was introduced into Europe from China and Japan by the Dutch and Spanish about 1555, and a few imitations of Genoese velvet were made of 'flock,' on small hand-made pieces, in England in the 16th century. In 1744 Jackson of Battersea, London, produced some panelled pictures, printed in oil from wooden blocks, interspersed with plain paper. Réveillon established a factory in Paris in 1760. Wall-paper came into general use about 1830, and the abolition of the paper duty in October 1861 raised

at once the output. 'Patterns of inconceivable hideousness' (*Arts and Crafts Essays*, by Walter Crane, 1893) were replaced by the Venetian, Indian, and Early English designs of William Morris, followed by Walter Crane and Heywood Sumner. Designing is now largely done by ladies.

Wall-paper is printed either from blocks or by machine. The former process is dearer but more efficient, machine-made paper being harder in effect, and the printing not so clearly defined. The wooden blocks coloured from the 'sieve,' and then pressed on the paper, each colour being separately printed and dried, unless 'patching' or 'blending' is resorted to, when several colours may be printed at once. The design, if fine, is outlined on the block in a kind of *cloisonné* of copper wire. A 'tireboy' (*tirer*) sees to the colours and dries the paper. To make 'flock' paper a mordant is printed on the coloured ground, to which the ground wool adheres as the paper passes through a drum or trough of linen. 'Silk flock' is used for a final coating, being of longer pile and glossier. Chameleon effects are produced by laying a transparent surface of flocking on ready printed designs, the glinting of shot silk being almost realized. Gold size, bronze, leaf metal, and lacquer are all used as ornaments. Paper embossed in high relief is first embossed and then adorned by hand; in low relief, first printed, and then embossed by pressure between intaglio and relief plates. In machine work designs are printed on paper coloured in pulp, or on distemper colours laid on and spread by fast-revolving brushes. All the colours are printed simultaneously, and the paper, passed over a long wooden framework, is then dried and folded. See *Art Journal* (1901), article by Horace Warner; and *Magazine of Art* (1900), article by Aymer Vallance.

Wall Plate, a plate laid along the top of the wall of a building to take the ends of the roof trusses, and distribute the weight of the roof along the top of the wall. See **ROOF** (in carpentry).

Wallsend, munic. bor., Northumberland, England, on the l. bk. of Tyne, 4 m. E.N.E. of Newcastle; marks the termination of the Roman wall. It is a shipbuilding and manufacturing centre. Coal is produced. Pop. (1901) 20,647.

Wall Trees and Fruit. Many climbing plants do best when growing against a wall; in the warmer parts of England, against walls facing south or west such fruits as nectarines, peaches, apricots, and figs may be grown. The walls should be not less than eight feet in height, and

should be furnished with a stone coping projecting some three inches on either side, or preferably with glass copings projecting nine inches or more and supported by iron props. For fastening the branches to the walls some system of wiring is preferable, the branches being attached to the wires by cord or loosely applied lead wire.

Walmer Castle, Kent, England, 2 m. S. of Deal, was built by Henry VIII. Until 1905 it was the official residence of the Warden of the Cinque Ports; it is now open to the public. The Duke of Wellington died here (1852).

Walmer Whirlwind. See **WHIRLWIND**.



Walnut (*Juglans regia*).

1, Female flower; 2, do., section; 3, stamen; 4, male flower; 5, fruit; 6, do., pericarp removed; 7, cotyledons.

Walnut (*Juglans regia*), a tree grown in Britain for its fine foliage and handsome habit, as well as for its timber and its fruit. It will thrive in any soil of moderate quality and good depth, and is not very subject to disease. Propagation is effected by means of seeds, or by grafting or budding; but the trees do not come absolutely true from seed. The black walnut (*Juglans nigra*) grows extensively in the United States, where it often reaches sixty feet in height.

Walpole, HORACE, FOURTH EARL OF ORFORD (1717-97), English author, was born in London, the youngest child of Sir Robert Walpole. In 1739 he started on the grand tour of France and

Italy, in company with Gray the poet. At Florence he made the friendship of Horace Mann, with whom he maintained an unbroken correspondence for forty years. At Reggio Walpole and Gray quarrelled, and parted company; but the breach was repaired three years later. After his return to England, Walpole represented in Parliament Callington (1741-54), Castle Rising (1754-7), and King's Lynn (1757-68). His memoirs and correspondence are important sources of information for the inner political history of his time. An ample fortune—mainly derived from the lucrative sinecure offices of usher of the Exchequer, clerk of the Escheats, and controller of the Pipe—enabled him to indulge fully his



Horace Walpole.

sociable and antiquarian tastes. In 1747 he purchased the villa of Strawberry Hill, near Twickenham on the Thames, and its adornment became thenceforth the hobby of his life. Here, in 1757, he established his printing-press, the first book to be issued being Gray's *Odes*, with illustrations by Bentley. In 1764 he published *The Castle of Otranto*, which helped to inaugurate a school of romance, just as his 'paper fabric' on the Thames stimulated the revival of Gothic art. His antiquarian works, notably the *Catalogue of the Royal and Noble Authors of England* (1758), *Historic Doubts of the Life and Reign of King Richard the Third* (1768), *Anecdotes of Painting in England* (1762-71; republished by Wornum, 3 vols. 1839), and *Catalogue of Engravers Born and Resident in England* (1763), show acuteness and diligence of re-

search. In ease, playful wit, racy description and anecdote, variety of topic, and lightness of touch, no letter writer—unless it be Madame de Sévigné—has surpassed him. It is in the deeper qualities of mind and heart that he is found wanting. In character he was affected, capricious, and sometimes spiteful, but not incapable of generosity and warm friendship. His collections were dispersed under the hammer in 1842. The standard editions of the *Letters* are that of Peter Cunningham (9 vols. 1857-9), to which must be added those included in Miss Berry's *Journal and Correspondence* (1865), and that of Toynbee (16 vols. 1903-6). He also wrote *Memoirs of the Last Ten Years of the Reign of George II.* (ed. by Lord Holland, 1822); *Memoirs of the Reign of King George III.* (ed. by Marchant, 1845); the supplementary *Journal of the Reign of George III. from 1771-83* (ed. by Dr. Doran, 1859); and the *Reminiscences* (1805), written for the Misses Berry. See *Life*, by Austin Dobson (1890); *Horace Walpole and His World*, by L. B. Seeley (1884); and Lord Macaulay's *Essay on Walpole's Letters to Sir Horace Mann* (1833).

Walpole, ROBERT. (1676-1745), English statesman, was born at Houghton in Norfolk. Returned to Parliament for Castle Rising in 1701, and in 1702 for Lynn, both places being pocket boroughs of the Walpole family, he joined the Whigs, and in 1708 was made secretary for war. In 1710 he became treasurer of the navy. The Tory party brought a charge of corruption against Walpole in connection with his position as secretary for war. He was sent to the Tower, expelled from the house, and declared to be disqualified for reelection during the Parliament. The borough of Lynn at once elected him, but he was again expelled. A firm upholder of the Hanoverian dynasty, Walpole, on the accession of George I., held office in the Whig ministry which the king appointed. After occupying for a year the post of paymaster of the forces, he was appointed in 1715 first commissioner of the Treasury and chancellor of the Exchequer. In 1717 he resigned in consequence of the king having dismissed his friend Townshend, and having transferred his favour to Sunderland and Stanhope. In opposition, Walpole distinguished himself by his attack on the Peerage Bill of Sunderland, whose object was to make the House of Lords a close corporation. His speech, which was the means of defeating the measure, has been described as one of the most masterly ever delivered in the House of Com-

mons. In the financial panic occasioned by the South Sea disaster the nation looked to Walpole for deliverance, and all the more readily as he had from the first denounced the scheme. He was made lord of the Treasury and chancellor of the Exchequer, and became virtually supreme in the government—a position which he held for twenty-one years. George II. was a difficult king to manage, but, thanks to Walpole's tactful influence with the queen, difficulties were smoothed over. Queen Caroline grasped the truth, and acted on it, that the Hanoverian dynasty was bound up with the parliamentary constitution. During his long career Walpole was inspired by three desires—to bring the court and the House of Commons into working alliance, by identifying the Hanoverian dynasty with parliamentary institutions; to unite the nation under the new dynasty, by keeping as free as possible from entangling foreign alliances; and to make the nation prosperous, by fostering individual energy and commercial development. In 1721 appeared in the king's speech the first definite enunciation of the principles of free trade in the fiscal government of the nation. All Walpole's fiscal measures were framed on these lines; he saw through the dangerous doctrine that colonies exist exclusively for the fiscal purposes of the mother country. On one occasion, when advised to put a tax upon the American colonies, he refused, on the ground that his object was to encourage colonial commerce. His fall was due to his inability to restrain the popular feeling over the war with Spain, the watchword of which was the famous 'Jenkins's ear.' He resigned on Feb. 2, 1742, and was created Earl of Orford, Feb. 9. A committee of the House of Commons reported against him in connection with a charge of bribery; but the proceedings collapsed.

At first sight it seems strange that a man like Walpole—a man of coarse moral fibre, addicted to gross pleasures, and of no intellectual tastes—should have left an enduring impress on the history of England. His policy was essentially one of peace. His great task lay in gradually reconciling the reluctant nation to the new dynasty. He scrupled at no method of carrying out his policy. He did not hesitate to stoop to parliamentary corruption, if by that means he could increase the power of the Whigs, and reduce the friction between the throne and the people. Under him the Hanoverian dynasty took firm root, parliamentary institu-

tions gradually emerged from the chaos of the revolution period into something like the modern form, and the prosperity of the nation, unchecked by foreign complications, moved steadily forward. Walpole's influence was reflected in the general manners of the time, which was in this regard one of the most repulsive in the national annals. See *Lives* by Coxe (3 vols. 1798) and Ewald (1877).

Walpole, SIR SPENCER (1839), English administrator and author, entered the War Office

N. Bavaria, a British saint who formed one of the mission to Germany under St. Boniface. Her day being May 1, she has been associated with 'Walpurgis Night,' when the witches hold revel on the Harz Mts. Her life is to be found in the *Lives of the Women Saints of our Contrie of England*, edited by C. Horstmann (1886); also in Capgrave's *Nova Legenda Angliæ* (1516).

Walrus, or MORSE (*Trichechus rosmarus*), a large pinniped carnivore, nearly related to the eared seals, but constituting a

the body, and the first and fifth toes are larger than the three median ones. The toes of the hind feet have, further, large lobes projecting beyond the ends of the bones. External ears are totally absent, however—a point of distinction from the eared seals—and the canines of the upper jaw are greatly enlarged to form the conspicuous projecting tusks. The muzzle is divided into two parts by a groove between the nostrils, and the upper lip is furnished at each side with a number of conspicuous bristles. The tail is small, the fore limbs nearly as large as the hind, and there are five small claws on both fore and hind feet. As regards the teeth, the walrus is peculiar. In the upper jaw, apart from the huge tusks, there are in the adult only four small teeth at each side. One of these is an incisor; the other three are premolars. In the lower jaw there is no incisor; a small tooth represents the tusk of the upper jaw, and behind it there are three premolars, as in the upper jaw.



Robert Walpole.
(Portrait by Kneller.)

(1858); was made an inspector of fisheries (1867), and appointed lieutenant-governor of the Isle of Man (1882), which post he held till he became secretary to the Post Office (1893-9). Among his works are *Life of Spencer Perceval* (1874), *The Electorate and the Legislature* (2nd ed. 1892), *Foreign Relations* (1882), *History of England from 1815* (new ed. 1890), *Life of Lord John Russell* (2nd ed. 1891), *The Land of Home Rule* (1893), and *The History of the Twenty-five Years* (1904).

Walpurga, or WALBURGA (d. 778), abbess of Heidenheim in

special family, the Trichechidae. It is confined to the Arctic regions, and occurs in two varieties, a Pacific and an Atlantic form. On the coast of Alaska it was formerly very abundant, and also in the Atlantic at one time, as far south as the coasts of Nova Scotia, Newfoundland, and Labrador on the west and the north of Scotland on the east. The walrus is a clumsy animal, reaching a length of twelve feet and a weight of 3,000 lbs. As in the eared seals, the hind limbs are capable of being turned forwards to support the weight of



Walrus.

In the young, however, the teeth number thirty. The tusks of the adult are used primarily for digging up the bivalve molluscs on which the walrus feeds; but they are also used to assist the animal to climb upon the ice, and to clamber about the surface of the rocky islands which it haunts. The other teeth have low blunt crowns, and are used to crush the shells of molluscs. Fish, crustaceans, and seaweed are also eaten, though the last possibly only for the sake of its animal contents. The young walrus is covered with short brownish fur, but this becomes rubbed off with advancing years, and very old males may be practically naked. The skin is much wrinkled, and in the males is usually much marked with scars, owing to the fights which take place during the breeding season. Walruses are usually found in the vicinity either of land or of floating ice. They are markedly social, and, except at the breeding season or when attacked, are gentle and inoffensive. It would appear that the females breed only once in three years, and they are singularly devoted to their young, which they suckle for two

years. Walruses are hunted for the sake of their oil, and for their hides and the ivory of the tusks. Hunting in the water is carried on by harpoons from boats, while on land the animals are stabbed or shot.

Walsall, munic., par., and co. bor., Staffordshire, England, 8 m. N.W. of Birmingham. Iron and brass founding, tanning, currying, saddlery and harness furnishings, are important industries, and there are extensive collieries. Pop. (1901) 86,440.

Walsh, WILLIAM (1663-1708), a man of fashion devoted to letters, was born at Abberley, Worcestershire; was M.P. for Worcestershire (1698-1702), and for Richmond (1705). He steadily advocated the Protestant succession. Walsh was the author of elegies and love poems. In *Delia*, one of five pastorals, he eulogizes Mrs. Tempest, the subject of Pope's fourth pastoral. Walsh was a dramatic collaborator with Congreve and Vanbrugh, and in prose he wrote *Dialogue concerning Women, being a Defence of the Sex* (1691), and the posthumous *Esculapius, or the Hospital of Fools* (1714). Pope's *Correspondence with Walsh* (1735) is of great interest. The *Works of William Walsh* appeared in 1736. See *Lives* by Johnson and Cibber (1753).

Walsham, NORTH, mkrt. tn., Norfolk, England, 14 m. N.N.E. of Norwich; has market cross (1600). Pop. (1901) 3,981.

Walsingham, tn., Norfolk, England, 5½ m. N.E. of Fakenham. An Augustine priory (founded 1061, and refounded 12th century) had a shrine much resorted to in mediæval times. Pop. (1901) 860.

Walsingham, SIR FRANCIS (c. 1536-90), English statesman, born at Chiselmhurst. His first diplomatic appointment was as ambassador to France in 1570. On his return (1573) Elizabeth made him a secretary of state. He was then employed in important negotiations with the Netherlands, France, and Scotland. In Mary Queen of Scots he saw a dangerous enemy to the English throne, and managed to intercept her letters, copying them and sending them on to their destination, and treating the replies in the same fashion. He was one of the commission appointed to try Queen Mary at Fotheringhay. Walsingham belonged to the Puritan party.

Walsingham, THOMAS (d. 21422), English historian, was born probably in Norfolk, and became a monk at St. Albans. He is the best authority for the reigns of Richard II., Henry IV., and Henry V., including the insurrection of Wat Tyler and the Lollardist movement started by

Wycliffe. Walsingham wrote six chronicles, of which we possess five—*Chronicon Anglie* (1328-88); *Gesta Abbatum* (1390); a nameless chronicle (1272-1394, the St. Albans ms.); *Historia Anglicana* (1272-1422); *Ypodigma Neastrie* (Normandy, 1066-1418), all published in the Rolls Series.

Walter, LUCY (?1630-58), mistress of Charles II. and mother of the Duke of Monmouth, was born in Pembrokeshire, and was taken or sent to the Hague, where in 1648 she captivated Charles II. She returned to England in 1656, but after being imprisoned in the Tower, was deported by order of Cromwell. She died in Paris. Between 1673 and 1680 the rumour was circulated, in the interests of Monmouth's succession, that she had been legally married to Charles II., but the king made three solemn declarations of denial.

Walter Family. See TIMES, THE.

Waltham, city, Middlesex co., Massachusetts, U.S.A., on the Charles R., 10 m. W. of Boston. It manufactures watches and textiles. Pop. (1900) 23,481.

Waltham Holy Cross, tn., Essex, England, on Lea, 13 m. N. of London; has remains of an abbey built by Henry II., the restored nave being now the parish church. In an earlier church King Harold is said to have been buried. There are gunpowder and cordite works, and market-gardening is carried on. Pop. (1901) 6,547.

Walthamstow, par. and metropolitan industrial suburb, near Epping Forest, 7 m. N.E. of London, England. Pop. (1901) 95,125.

Walther von der Vogelweide (c. 1160-c. 1230), the most renowned of the minnesingers of Germany, began his career as a poet at the court of the archduke of Austria, but after 1198 led the life of a wandering minstrel until taken into favour by the Emperor Frederick II. He was the first of the minnesingers to use his verse as a political weapon, but the genre in which he excelled was the lyric. His poems were edited by Lachmann (5th ed. 1875) and by Pfeiffer (6th ed. 1880). See *Lives* by Uhland (1822) and Wilmanns (1882).

Walter, CHARLES ALBERT (1846), French etcher, was born at Paris; became a pupil of Gérôme, and obtained the Prix de Rome (1868); but soon abandoned painting for etching, in which he has achieved a world-wide reputation. Besides copperplates after Rembrandt, Van Dyck, Rubens, and Velasquez, he has etched *Dans la Rosée*, after Duran; *Christ before Pilate*, after Munkacsy; *Mrs. Graham*, after Gainsborough; and *L'Angelus*, after Millet.

Walton, BRIAN (1600-61), English Biblical scholar, was born in Yorkshire. In 1626 he was appointed rector of St. Martin's Orgar in London. In 1641 he was deprived of his living, and thenceforth devoted himself to the preparation of his Polyglot Bible (1654-7). He had the assistance and sympathy of Usher, Lightfoot, and other scholars, and the patronage of Cromwell. Nine languages are used, although no portion of Scripture is presented in all the nine—Hebrew, Chaldee, Samaritan, Syriac, Arabic, Persian, Ethiopic, Greek, and Latin. He became bishop of Chester in 1660.



Izaak Walton.

Walton, IZAAK (1593-1683), English biographer and angler, was born at Stafford, and became an ironmonger in Fleet Street, London, near St. Dunstan's. He had other literary acquaintances, amongst whom were Ben Jonson, Michael Drayton, and Sir Henry Wotton, and was himself given to versifying as well as to the citizen's sport of angling. He helped Sir Henry Wotton to collect material for the life of Donne, and when Wotton left it unfinished in 1639, wrote it himself. This was the first of his famous biographies. About 1644 Walton settled at Stafford. By 1650 he was back in London, living at Clerkenwell. In 1653 he published *The Compleat Angler*. After the restoration he lived with George Morley, bishop of Winchester, and subsequently with W. Hawkins, prebend of Winchester. He also visited on the Dove Charles Cotton, who wrote the second part of the *Angler*. Walton's works include *Life of Donne* (1640; ed. H. K. S.

Causton, 1852); *Life of Wotton* (with *Reliquiae Wottonianae*, 1654); *Life of Hooker* (1665); *Life of George Herbert* (1670); *Life of Sanderson* (1678); *Collected Lives* (1670; ed. A. H. Bullen, 1884; ed. V. Blackburn, 1895; ed. A. Dobson, 1898; ed. A. W. Pollard, 1901); *Complete Angler* (1653; ed. J. R. Lowell, 1889; ed. A. Lang, 1896; ed. R. Le Gallienne, 1896-7; ed. A. Dobson, 1899; ed. J. Buchan, 1899; ed. Clarendon Press, 1900); *Waltoniana* (ed. R. H. Shepherd, 1878). See *The Percentenary of Isaac Walton* (1893); R. B. Marston's *Walton on Fish and Fishing* (1894); Martin's *Isaak Walton and his Friends* (1903); and *Bibliography* by A. Wood (1900).

Walton-on-Thames, tn., Surrey, England, 17 m. s.w. of London; a resort of anglers and tourists. Here is the Metropolitan Convalescent Institution, founded 1840. Pop. (1901) 10,329.

Waltz, a dance in $\frac{3}{4}$ time, performed by dancers in couples, with sliding steps and a revolving motion. Besides the popular music constantly produced for this dance, there is music of a more classical kind, of which the waltzes of Strauss are the most noteworthy. Yet another type of waltz is represented by those of Chopin and Liszt, in which the form is utilized for compositions often of distinguished merit and charm, though not intended for use as dance music.

Wampum, a sort of broad belt formed of strings of shells, and worn as an ornament or girdle by the North American Indians. The name has also been given to the interior parts of the clam shell, formerly used as money among them.

Wanderer, THE, a poem in the *Exceter Book*. There is an almost complete absence of Christian sentiment; but from the standpoint of poetic art it is the finest poem in Old English—a long lament for the joy and glory of past days. The text is in Sweet's *A.S. Reader*. See Wülker's *Grundriss* and the American *Journal of Germanic Philology* (1902).

Wandering Jew, THE. See JEW, THE WANDERING.

Wanderoo, or WANDERU, a name applied in Ceylon to the various species of langur which inhabit that island, notably to *Semnopithecus cephalopterus*, and also, though incorrectly, to one of the macaques, the lion-tailed monkey (*Macacus silenus*), found in W. India.

Wandiwash, tn., N. Arcot dist., Madras Presidency, India, 30 m. s.w. of Chengalpat. It figured prominently in the wars of the Karnatic, and was the scene of the victory by Sir Eyre Coote over the French in 1760.

Wandsbek, or WANDSBECK, tn., Schleswig-Holstein, Prussia, 3 m. N.E. of Hamburg, of which it is practically a suburb; has manufactures of oleographs and tobacco. There is a monument to Claudius, who issued *Der Wandsbecker Bote* weekly (1771-75). Pop. (1900) 27,966.

Wanganui. (1.) Town, New Zealand, on Wanganui R., 4 m. from the sea, 95 m. N. of Wellington. It has freezing works and a collegiate school. Pop. (1901) 7,331. (2.) River, New Zealand, 120 m. long; rises at the base of Mt. Tongariro, and flows into the S. Taranaki Bight, on the w. coast of the North Island of New Zealand. It is a favourite holiday resort. There is a bar at the mouth, but the town is accessible by sea-going steamers drawing thirteen feet of water.

Wanks. See COCO.

Wantage, mrkt. tn., Berkshire, England, 1 m. from the Berks and Wilts Canal. It was a royal residence in the time of the West Saxons, and is famous as the birthplace of Alfred the Great in 849. The church is an ancient cruciform structure. The town hall is a handsome modern building; schools have been established in commemoration of Alfred, and a fine marble statue of that king was erected in 1877. There are brass and iron works. Bishop Butler, author of the *Analogy*, was born here in 1692. Pop. (1901) 3,766.

Wapenshaw, an obsolete Scotch military meeting or review, especially stringent and compulsory under the Stuarts, when the lieges were compelled to collect themselves, at certain times and within certain specified areas, to 'show their weapons' of military defence, and prove that they were fit—according to their rank—to take the field at a moment's notice. Various kinds of sports, such as shooting at the butts, were in vogue at these gatherings.

Wapentake. In Yorkshire, Lincolnshire, Nottinghamshire, Derbyshire, Rutland, and Leicestershire the divisions of 'hundreds' are known as wapentakes.

Wapiti (*Cervus canadensis*), a North American deer, belonging to the same group as the Scottish red deer, often misnamed elk in America. The antlers are greatly developed, are smooth, and have the surrorial tines, usually three or more in number in the adult, flattened and expanded, while the beam is markedly curved backwards. The colour is dark brown on the head and neck, gray on the back, flanks, and sides, and blackish below, the legs being brown. The height at the shoulder is about five and a half feet in a full-grown stag,

which may weigh as much as a thousand pounds. In habits the wapiti resembles the red deer.



Wapiti.

Wappers, EGIDE CHARLES GUSTAVE (1803-74), Belgian painter, was born at Antwerp, where he became professor of the Academy (1832); was director (1840-53) of the same, and president (1846-53) of the Belgian National Museum. His first great work was *Dévoement du Bourgmestre de Leyde* (1830). From Antwerp he was called by the court to Brussels, where he executed a large number of works for the Paris salon, including *Le Christ au Tombeau*, *Scènes des Journées de Septembre*, *L'Adieu de Charles I. à ses Enfants*, *La Tentation de Saint Antoine*, *Geneviève de Brabant*, and *Christophe Colomb*. For the gallery of Versailles he was commissioned by Louis Philippe to paint *La Défense de l'île de Rhodes par les Chevaliers de Saint-Jean de Jérusalem* (1844).

War. While civilization is impotent to prevent the outbreak of war, it has done much towards mitigating its horrors by bringing about a consensus among all cultivated peoples that, while it is legitimate to put forth the utmost force in order to render the enemy powerless, no act of violence or destruction useless to that object, and merely wanton or reckless, shall be permissible; hence 'customs of war' which make it foul play to molest peaceful inhabitants who safeguard their property, which forbid ill-treatment of prisoners, which prescribe immunity for flags-of-truce and for hospitals, and so forth.

The Romans not only gave their armies a careful organization and rigid discipline, but also understood strategy and tactics. But in the ages which followed the fall of the Roman empire there was a great relapse into barbarism. In the new

civilization of the feudal period, improvement in the forms of warfare was gradual if slow. The invention of gunpowder was the first of many discoveries, which, while they have made war more destructive and more terrible, have also bestowed on it a swifter and more critical action. And the growing perfection of firearms, the invention of new and powerful explosives, together with those of steam and electricity, and their application to navigation, railways, and telegraphs, wrought great changes during the 19th century. Where months were required to mobilize an army alone, railways allow a modern army to be gathered together in a few days; where formerly a courier took a week to carry intelligence and orders, the telegraph now conveys them in a few minutes. The sudden calamity and ruin which overtake a nation beaten in war make modern states wary of indulging in it. In modern war thousands may perish in a few minutes, as happened, for instance, at St. Privat in the Franco-German war of 1870-1; no battle in the Thirty Years' war can show any such terrible and sudden episode. Yet if we read the history of the latter war, we find that three-quarters of the population of Germany was exterminated, and the country had become, to a very great extent, a forest and a wilderness before its close.

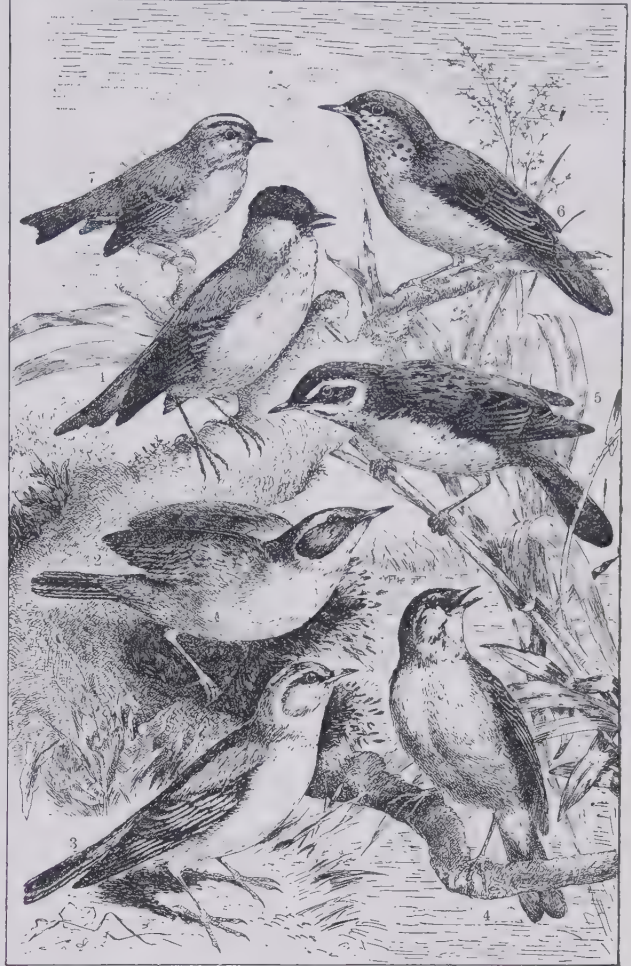
A war, politically speaking, may be offensive or defensive; but the operations on both sides must be of both natures. War may be waged on the sea as well as on the land. A powerful fleet is indispensable to a maritime nation; while an insular power cannot even convey its armies abroad except under the safeguard of its warships. Further, in the defence of its shores its fleets will probably play the more important part. But it is not always easy to bring a war to a decisive issue by the action of a navy alone. The considerations which determine the actual operations of war, and the methods by which these are carried out, belong to the provinces of strategy and tactics.

Waratah, post tn., New South Wales, Australia, co. Northumberland, 4 m. N.W. of Newcastle. The principal industries are fruit-growing, coal-mining, copper-smelting, and brick-making. Crystal Palace Gardens are a holiday resort. Pop. (1901) 3,080.

Warbeck, PERKIN (1474-99), pretender to the English crown, claimed to be the younger of the two Yorkist princes murdered in the Tower by Richard III., and

his claims were supported by the Duchess of Burgundy, the sister of Edward IV. and aunt of the victims. In 1491 he landed in the south of Ireland, and having obtained recognition there, he proceeded to the French court, which assisted him in an ineffectual attempt to make a landing in

Warblers are usually regarded as constituting a subfamily (*Sylviinae*) of the thrush family. They differ from the typical thrushes in their smaller size, in the fact that their plumage is usually plainly coloured, and in being more markedly insectivorous. They are more distinctly migratory in



Warblers.

1. Blackcap warbler (*Sylvia atricapilla*). 2. Reed-warbler (*Acrocephalus streperus*). 3. Wood-warbler (*Phylloscopus sibilatrix*). 4. Garden-warbler (*Sylvia hortensis*). 5. Sedge-warbler (*Acrocephalus phragmitis*). 6. Grasshopper-warbler (*Locustella naevia*). 7. Gold-crested wren (*Regulus cristatus*).

Kent (1495). After several other unsuccessful attempts he went to Cornwall (1497), but when he met with armed opposition he fled into sanctuary. He was imprisoned, escaped, and was finally confined in the Tower, where, in company with the Earl of Warwick, he was executed (1499).

Warble-fly. See BOT-FLY.

their habits than thrushes. A large number of warblers are British—as the blackcap, white-throat, chiffchaff. The garden-warbler (*Sylvia hortensis*) is a member of the same genus as the blackcap and the whitethroat. It is olive brown above and paler below, and is about the same size as the blackcap. Other warblers

of the same genus are the barred warbler (*S. nisoria*), the Dartford warbler (*S. undata*), and the Orphean warbler (*S. orphea*). To the genus *Phylloscopus* belong the chiffchaff (*P. collybita*), the willow-wren (*P. trochilus*), and the wood-warbler (*P. sibilatrix*). The reed-warbler (*Acrocephalus streperus*), which is frequent in summer in certain localities in England, is an example of a genus with a considerable number of British representatives. Commoner is its ally, the sedge-warbler or sedge-bird (*A. phragmitis*), which occurs throughout Great Britain generally. To the genus *Locustella* belongs the grasshopper-warbler (*L. naevia*). To the warbler family belong also the members of the genus *Regulus*, of which *R. cristatus* is the gold-crested wren; *R. ignicapillus*, the fire-crested wren; and *R. caelendula*, the ruby-crested wren of the United States. Most of the warblers are Old World birds, and in N. America the name is applied to the member of a different family, the Mniotiltidae, probably most nearly allied to the tanagers. These American warblers are rather small birds, and somewhat resemble tits in their habits. There are a large number of species, many of which belong to the genus *Dendroica* or wood-warblers, of which the black-throated green warbler (*D. virens*) is an example.

Warburton, Bartholomew Elliott George, usually known as **ELIOT Warburton**. (1810-52). Irish author, was born at Aughrim, Co. Galway, and busied himself with the management of his Irish property and with literary pursuits. He wrote *The Crescent and the Cross* (1844), *Memoirs of Prince Rupert* (1849), and *Darien, or the Merchant Prince* (1851). He developed a great passion for travel, and perished on the burning steamer *Amazon* while on his way to Panama.

Warburton, John (1682-1759), English antiquary, was born in Lancashire, and appointed Somerset herald in the College of Arms (1720). He was a great collector, and it was an irreparable loss when his manuscript copies of Elizabethan plays were destroyed by fire, for most of them were unique copies. He prepared and issued a *Map of Northumberland* (1716), a *Map of Middlesex* (1749), and in 1753 *Vallum Romanum*, or the *History of the Roman Wall in Cumberland*, from his own surveys.

Warburton, Sir Robert (1842-99), British soldier, was of British and Afghan parentage. From 1879 until 1897 he was warden of the Khaibar Pass. His last service was with the Tirah expe-

dition of 1897-8. See his *Eighteen Years in the Khyber* (1900).

Warburton, William (1698-1779), English divine, was a native of Newark, and in 1727 he was presented to the living of Brant-Broughton, Lincolnshire. In 1736 he published his *Alliance between Church and State*, which Bolingbroke fitly described as an attempt to rest a theory on a fiction. The first six books of the author's ambitious work, *The Divine Legation of Moses*, appeared in 1737-8, and another was issued in 1788. Its purpose is to refute the deistic assumption that the Mosaic economy, as it does not postulate the immortality of the soul, cannot be credited with divine authenticity. By his six letters to M. de Crousaz, containing his *Vindication of Pope's Essay on Man* (1740), Warburton won the gratitude and affection of Pope. His strenuous and redundant *Commentary on the Essay of Man* appeared in 1742. Pope made Warburton his literary executor. In 1746 Warburton was appointed preacher of Lincoln's Inn, and in three successive years (1753-5) he was prebendary of Gloucester, king's chaplain, and prebendary of Durham. In 1757 he became dean of Bristol, and in 1759 he was appointed bishop of Gloucester. In his *Doctrine of Grace* (1762) Warburton assailed Wesley, prompting retorts from both Wesley and Whitefield. To literature he contributed an unsatisfactory edition of Shakespeare (1747), a work on *Julian the Apostate* (1750), an annotated edition of Pope (1751), and *Lord Bolingbroke's Philosophy* (1756). *The Principles of Natural and Revealed Religion—Sermons* appeared in 3 vols. (1753-67). In 1768 Warburton sunk £500 to found the lecture on prophecy designated from his name, and afterwards delivered in Lincoln's Inn chapel. Warburton's works (7 vols.) were edited by Bishop Hurd (1783). See his *Literary Remains* (ed. F. Kilvert, 1841); *Life of Warburton*, by J. Selby Watson (1863).

Ward, Adolphus William (1837), English historian; became (1866) professor of history and English literature at Owens College, Manchester, and principal from 1890-7. He has also held the vice-chancellorship of Victoria University, which owes its existence partly to him. His election as master of Peterhouse, Cambridge, took place in 1900. Among his works are *The House of Austria in the Thirty Years' War* (1869); *History of English Dramatic Literature to the Death of Queen Anne* (1875 and 1899); *The Counter-Reformation*, in the *Epochs of Church History Series*; *Chaucer* (1880) and *Dickens* (1882), in the

English Men of Letters Series; and *The Electress Sophia and the Hanoverian Succession* (1903).

Ward, Artemus. See **Browne, C. F.**

Ward, Edward (1667-1731), English writer of humorous and satiric verse, was born in Oxfordshire, and settled down to keep a public-house in Moorfields, London. In consequence of the political bearings of his *Hudibras Redivivus*, he had to stand twice in the pillory (1705). Butler was his model, and the Low Church party the object of his profanity and revilings. His collected writings were issued in six volumes (1724).

Ward, Edward Matthew (1816-79), English genre and historical painter of the Victorian era, born in London. He studied in the Royal Academy schools, then for three years in Rome, and finally in Munich under Cornelius. On his return to England he painted *Cimabue and Giotto*; in 1845 he exhibited in the Academy his *Doctor Johnson in Lord Chesterfield's Ante-Room* (Tate Gallery, London); was elected A.R.A. in 1847, and R.A. in 1855, after receiving the commission to paint eight frescoes for the House of Commons. One of his best-known works, *The South Sea Bubble* (Tate Gallery), was exhibited in 1847; *Marie Antoinette parting with the Dauphin* in 1856; and in 1859 *Marie Antoinette listening to her Act of Accusation*. See *The Life and Works of E. M. Ward* (1879), by T. Dafforne; and *The English School of Painting* (1884), by E. Chesneau.

Ward, Sir Edward Willis Duncan (1853), permanent under-secretary for war and secretary to the Army Council, was supply officer to Sir George White during the siege of Ladysmith, and it was mainly due to his skill and resource in providing provisions that the garrison was able to hold out until relief arrived. He joined the Army Service Corps in 1875, and took part in the Sudan expedition of 1885, when he was specially mentioned in dispatches. He also took part in the Ashanti campaign of 1895-6.

Ward, Elizabeth Stuart Phelps (1844), American novelist and religious essayist, born at Andover, Massachusetts. In 1888 she married Herbert D. Ward. She has written for children and for adult readers—e.g. *The Gates Ajar* (1868); *Men, Women, and Ghosts* (1869); *The Silent Partner* (1871); *Poetic Studies* (1875); *The Story of Avis* (1877); *Sealed Orders* (1879); *Doctor Zay* (1882); *Beyond the Gates* (1883); *The Madonna of the Tufts* (1886); *The Gates Between* (1887); *Come Forth* (1890), and *The Master of the Magicians*

(1890)—the two last with Herbert D. Ward; *A Singular Life* (1894); *Within the Gates* (1901); *Avery* (1902); and others. See her *Chapters from a Life* (1896).

Ward, GENEVIÈVE (1838), American actress, was born at New York, U.S.A. Previous to her appearance on the dramatic stage she won distinction as an operatic singer, and made her début in that capacity in 1856 under the name of Ginevra Guerabella. In 1873 she appeared as Lady Macbeth at the Theatre Royal, Manchester. In 1879 she produced the play *Forget-me-not*, and subsequently toured with it all over the world. After that she acted with Sir Henry Irving at the Lyceum in *Becket*, *King Arthur*, and *Richard III*. In 1855 she married the Count de Guerbel.

Ward, HARRY MARSHALL (1854), English botanist; has been professor of botany in Cambridge University since 1895, having previously been for ten years professor of botany in Forest School, Cooper's Hill. His works include *Timber*, and some of its Diseases (1889); *The Oak* (1892); *Grasses* (1901); *Disease in Plants* (1901); and *Trees* (1904).



Mrs. Humphry Ward.

(Photo by J. Russell & Sons.)

Ward, MRS. HUMPHRY, née MARY AUGUSTA ARNOLD (1851), English novelist, granddaughter of Dr. Arnold of Rugby, was born at Hobart in Tasmania, and married (1872) Mr. Humphry Ward. After publishing a translation of Amiel's *Journal Intime* (1885), she attracted attention by *Robert Elsmere* (1888), a suggestive work on present-day spiritual problems in the form of a novel. This has been followed by *David Grieve* (1892); *Marcella* (1894); *Sir George Tressady* (1896); *Helbeck of Bannisdale* (1898); *Lady Rose's*

Daughter (1903); *The Marriage of William Ashe* (1905); and the plays *Eleanor* (1902), *The Little Sister of José* (1903), *The Marriage of William Ashe* (1905), *Fenwick's Career* (1906), and *The Playtime of the Poor* (1906).

Ward, JAMES (1769-1859), English artist, a native of London, earned a reputation by his mezzotints of *Cornelius* after Rembrandt, and *Mrs. Billington* after Reynolds. He was appointed painter and engraver to the Prince of Wales (1794), became A.R.A. (1807) and R.A. (1811). His best pictures are *The Bull Bait*, *The Bull*, *Landscape with Cattle*, *Council of Horses*, and *The Boa Serpent seizing a Horse*.

Ward, JAMES (1843), English philosopher, was born at Hull, and entered the Congregationalist ministry, but resigned his pastorate as the result of a change of views. He was fellow of Trinity College, Cambridge (1875), and professor of mental philosophy (1897). He was Gifford lecturer at Aberdeen (1895-7). He has published *Naturalism and Agnosticism* (1899; 2nd ed. 1903), and articles in *Encyc. Brit.* and *Mind*.

Ward, JOHN QUINCY ADAMS (1830), American sculptor, was born at Urbana, Ohio; studied under H. K. Brown (1850-6), and opened a studio in New York (1861), where he modelled *The Indian Hunter*, *The Good Samaritan*, and *The Freedman*. His later works are *The Citizen Soldier*, statues of Generals Washington, Reynolds, Putnam, Thomas, Morgan, and Lafayette, and the colossal representations of Garfield and Washington for the New York Treasury building. Two of his best works are the statues of Henry Ward Beecher and Horace Greeley.

Ward, NATHANIEL BAGSHAW (1791-1868), English botanist, was born in London; and in 1833 invented the Wardian case for the transmission of growing plants. The Cavendish banana was introduced into Fiji and Samoa, and tea and cinchona into Assam, by its means. Ward published *On the Growth of Plants in closely-glazed Cases* (1842).

Ward, THOMAS HUMPHRY (1845), English author, husband of the novelist, was born at Hull; was elected a fellow of Brasenose College, Oxford (1869). He is on the staff of the *Times*. He is joint-author of a monograph on *Romney* (1904), and editor of *The English Poets* (1881-2), of *English Art in the Public Galleries of London* (1888), of the *Reign of Queen Victoria* (1887), and of *Men of the Reign* (1885).

Ward, WILFRID PHILIP (1856), English writer, born at Ware; became lecturer in philosophy at

Ushaw College, Durham (1890). He has published *The Wish to Believe* (1884), *The Clothes of Religion* (1886), *William George Ward and the Oxford Movement* (2nd ed. 1890), *Witnesses to the Unseen* (1894), *The Life and Times of Cardinal Wiseman* (1897), and *Problems and Persons* (1903).

Ward, WILLIAM GEORGE (1812-82), English theologian and controversialist, was born in London. He was the philosopher of the Oxford movement, though at first latitudinarian, being attracted on one side by Mill and Comte, and on the other by Newman. He published in 1844 his *Ideal of a Christian Church*, for which he was degraded (1845). He was received into the Roman Catholic Church the same year, and for many years lectured in the Catholic college of St. Edmund's, Ware. He was editor of the *Dublin Review* from 1863-78.

Warden. The Warden of the Cinque Ports has the authority of an admiral, and formerly exercised jurisdiction in proceedings at law and in equity. In old times the Warden of the Marches guarded the frontiers or marches of Wales and Scotland. The Warden of the Standards is the official who who has the custody of the imperial standards of length, weight, etc., by an Act of 1866.

Wardha, chief tn., Wardha dist., Central Provinces, India, 46 m. s.w. of Nagpur. It is an entrepôt for cotton. Pop. (1901) 9,872. The district has an area of 2,401 sq. m.

Wardian Cases are close, glazed cases, some kinds of which are used for packing pot plants that have to travel long sea-voyages, others being used for the cultivation of plants in rooms. Wardian cases are also used in the cultivation of ferns that require a very moist atmosphere. Some of the more delicate filmy ferns (e.g. *Trichomanes* and *Hymenophyllum*) luxuriate vigorously in these miniature plant-houses—more especially the Killarney fern. Others with fronds of delicate semi-transparency may be grown together with the curious American fly-trap (*Dionaea muscipula*), the Australian pitcher-plant (*Cephalotus follicularis*), and the side-saddle plants (*Sarcocaulon*).

Wardlaw, ELIZABETH, LADY (1677-1727), Scottish poetess, wrote *Hardyknute* (1719), the secret of the authorship of which was not divulged till Percy published the second edition of the *Reliques of Ancient Poetry*. With doubtful justification *Sir Patrick Spens*, *The Douglas Tragedy*, and other Scottish ballads, have been attributed to her.

Wardlaw, RALPH (1779-1853), Scottish divine, was born at Dalkeith; joined the Congregational body, and settled in Glasgow. He ultimately became professor of theology in the divinity school of the denomination in Scotland, and took a prominent part in public affairs, notably the anti-slavery movement. See *Life* by W. L. Alexander (1856).

Wardmote, the court of each ward of the City of London, presided over by the alderman of the ward. Wardmotes are held on St. Thomas's Day (December 21) for the election of common councillors. The wardmote also nominally inquires into the good conduct of the ward. See Pulling's *Laws and Customs of London* (1854).

Wardroom, the common mess-room of the commissioned officers, excluding the captain, in a man-of-war; originally the room over the gunroom, where the lieutenants and other officers messed and slept. In 1803 masters, surgeons, and pursers were given the title of warrant officers of wardroom rank, and were thus differentiated from the boatswain, gunner, and carpenter. With the establishment of naval instructors, and of engineers, in 1837, these two classes were added to the list of officers of wardroom rank.

Wardship, the right of guardianship, which was one of the incidents of feudal tenure.

Ware, tn., Hampshire co., Massachusetts, U.S.A., on the Ware, 23 m. W. of Worcester; has manufacturing of cotton and woollen goods, boots and shoes. Pop. (1900) 8,263.

Ware, tn., Herts, England, on Lea, 2 m. N.E. of Hertford. The 'great bed of Ware,' referred to by Shakespeare, has been removed to Rye House. There are malt works. Pop. (1901) 5,573.

Wareham, munic. bor., Dorsetshire, England, on Frome, near Poole harbour; ancient earthworks nearly surround the town. The old church of St. Mary was the first burial-place of Edward the Martyr. Pop. (1901) 2,003.

Warehousing. See BONDED WAREHOUSE.

Warham, WILLIAM (?1450-1532), archbishop of Canterbury, was born in Hampshire. He was created master of the rolls (1494), lord chancellor (1503), and archbishop in the same year. He was not in such great favour with the new king, Henry VIII., and was supplanted by Wolsey (1515). He was a supporter of the new learning, but though he accepted 'royal supremacy,' was hostile to the reformation of the church. See Hook's *Lives of the Archbishops* (1868).

Warkworth, vil., Northumberland, England, on Coquet, 7½ m. S.E. of Alnwick. The castle, founded 12th century, has a remarkable 15th-century keep. Near the river is an ancient hermitage excavated in the solid rock. Pop. (1901) 712.

War Medals and Clasps. See MEDAL.

Warming. See HEATING.
Warmminster, mrkt. tn., Wilts, England, 9 m. S. of Trowbridge, on W. border of Salisbury Plain. In the district are many ancient remains (Battlesbury, Scratchbury, Cley Hill). Longleat, the beautiful seat of the Marquis of Bath, is in the vicinity. Pop. (1901) 5,547.

Warner, CHARLES (1846), English actor, made his debut at Windsor Castle in 1861 in *Richelieu*, produced by Phelps, with whom he appeared, in the parts of Buckingham (*Richard III.*) and De Mauprat (*Richelieu*), on the last occasions the great tragedian strode the stage. Among Warner's notable impersonations have been Harry Dorton in *The Road to Ruin*, Charles Surface, Badger in *The Streets of London*, Michael Strogoff in *The Courier of the Tear*, Colonel Prescott in *Held by the Enemy*, Farmer Allen in *Dora*, Puff, Charles Courtley, Charles Middlewick in *Our Boys*, and Monsieur Garnier in *Leah Kleschna*. Of his Coupeau, in Reade's version of Zola's *L'Assommoir* ('Drink'), M. Coquelin asserted that it was 'one of the finest dramatic efforts ever seen on the stage.' His daughter, Grace Warner, excels as an actress in a wide range of parts.

Warner, CHARLES DUDLEY (1829-1900), American man of letters, born at Plainfield, Massachusetts. After practising law for several years in Chicago he turned to literature. He wrote: *My Summer in a Garden* (1870), *Saunterings* (1872), *Back-Log Studies* (1872), *Baddeck and That Sort of Thing* (1874), *In the Levant* (1877), *Being a Boy* (1877), *Life of Captain John Smith* (1881), *Life of Washington Irving* (1881), *Their Pilgrimage* (1886), *A Little Journey in the World* (1889), *The Golden House* (1894). He also edited a *Library of the World's Best Literature* (1897).

Warner, SUSAN (1819-85), American authoress, wrote under the nom. de plume of Elizabeth Wetherell a series of tales, of which the best known is *The Wide, Wide World* (1851). Her other works include *Queechy* (1852), *The Hills of Shatamuc* (1856), *Melbourne House* (1866), and *Little Annette* (1874). Her forte was the domestic story, with a liberal admixture of pathos and sentiment, on the merits of which opinions necessarily differ.

Warner, WILLIAM (?1558-1609), English poet, born in London; became an attorney, but was more prominent as a man of letters. His principal work was *Albion's England* (1586), a metrical British history from Noah to the Norman conquest, afterwards extended to 1606. He also wrote *Pan his Syrinx* (1585), and translated the *Menachmi* of Plautus (1595).

Warning Coloration is for the purpose of making an animal conspicuous and readily recognizable by its enemies, so that it may be avoided. The characteristic is usually associated with some unpleasant qualities, such as a bad odour or a nauseous taste; or with dangerous powers, as the possession of a sting or a poison fang; or even with appearance only, as in the case of some lizards and insects. Instances of warning coloration are specially prominent among the Felidae, Reptilia, and Insecta. See COLOURS OF ANIMALS.

War Office. At present the home of the headquarters of the British army is in Pall Mall, but it is shortly to be transferred to the handsome new pile of buildings in Whitehall. The department was entirely reorganized, on the recommendation of Lord Esher's committee, in August 1904. The military administration is now in the hands of an Army Council, consisting of four military members, with the secretary of state for war, the under-secretary for war, and the financial secretary as *ex-officio* members. Each military member is directly responsible to the secretary of state for one well-defined department; and the secretary of state is, in turn, responsible to Parliament for the efficient condition and administration of the army. Every military member of the Army Council has under him two or more principal officers, styled directors, in charge of sub-divisions of his department. In addition to the Army Council there is the inspector-general of the forces, whose duty it is to review generally the practical results of the policy of the Army Council, and to report upon them.

Warora, munic. tn., Chanda dist., Central Provinces, India, 65 m. S.W. of Nagpur; with coal mines. Pop. (1901) 10,626.

Warping, a mode of increasing the fertility of land along the banks of rivers liable to overflow, by allowing them to deposit their mud, called 'warp,' upon the surface overflowed.

Warrandice, in Scots law, an obligation or guarantee given by the granter of property that it will not be taken from the grantee by any one having a preferable title. In real warran-

dice one piece of land is given in security against eviction from the other. Personal warrant is of three kinds—(1.) Simple, which secures the grantee from eviction arising out of future deeds of the grantor. (2.) Warrant from fact and deed, which secures the grantee from eviction arising out of any deed, past or future, of the grantor. (3.) Absolute warrant, which protects the grantee against eviction on any ground existing in his right before the grant was made.

Warrant, a written authority from one person to another to do or receive something. The term has been confined in practice to (1) warrants of the sovereign under the sign-manual; (2) warrants issued by government departments (hence a warrant officer); (3) warrants to arrest or to search, but general warrants are illegal—that is to say, the name of the person to be arrested must be inserted in the warrant; (4) dock and dividend warrants, authorizing the delivery of goods out of bond, or the payment of dividends.

Warrant of Attorney, a written authority to an attorney to appear in court for the person giving the warrant and confess judgment, or allow judgment to go by default, in an action brought by or against that person. Warrants of attorney are subject to 32 and 33 Vict. c. 62, which makes provisions as to their form and validity.

Warrant Officers, NAVAL, officers who receive their rank by virtue of warrant as opposed to commission. Formerly there were a number of 'standing officers' who held warrants, and these included some who received their warrant from the Admiralty—i.e. the master and the surgeon—and others who received their warrant from the Navy Office—i.e. the gunsmith, master-at-arms, and sailmaker. These officers retained their appointments after their ships were paid off. Their chief duties, when not at sea, were to look after the stores of their various departments. Among the warrant officers of Pepys's time was the purser, who purchased his warrant. The gunner, boatswain, and carpenter in the days of the sailing navy were, as at present, warrant officers, but above them were the master and his mates, who, not until nearly the middle of the 19th century, with the purser, received commissions. The boatswain was formerly superior to the gunner in rank. With the introduction of steam the engineer was included, though engineers have long since been given commissions. Cadets and midshipmen, known as subordi-

nate officers, are still appointed by warrant, and are not commissioned until they are promoted to be sub-lieutenants.

MILITARY.—This rank is the intermediate step between the rank and file and a commission. The senior warrant officer of the army is the conductor of the Army Ordnance Corps, and receives pay at the rate of six shillings per day. Then in order come the following—staff sergeant-majors, master-gunners, corporal-majors of the household cavalry, bandmasters, and schoolmasters. No soldier below the rank of sergeant is eligible for promotion to warrant rank, except as bandmaster.

Warranty. By the Sale of Goods Act, 1893, a warranty is defined as 'an agreement with reference to goods which are the subject of a contract of sale, but collateral to the main purpose of such contract, the breach of which gives rise to a claim for damages, but not a right to reject the goods and treat the contract as repudiated.' It is always a question of construction whether a stipulation is to be read as a warranty or as a condition; but a buyer may elect to treat the breach of a condition as a breach of warranty. When the contract is in writing, evidence of a verbal warranty or condition is inadmissible. Warranties are either express or implied. In a contract of sale there is an implied warranty that the buyer shall have quiet possession, and that the goods are free from encumbrances; and an implied warranty that the goods are fit for a particular purpose may be annexed by the usage of trade. The following conditions are also implied:—that the goods correspond with their description or sample; that if to the knowledge of the seller the goods are sold for a specific purpose, the goods are fit for that purpose; that goods bought by description are of merchantable quality, if they have not been examined; and that goods bought by sample are free from defects undisclosed by the samples. On the sale of a horse there is no implied warranty that it is sound. In a contract for the hire of a specific chattel—as, for example, a particular steam tug—there is no implied warranty of its fitness for the purpose it is to be used for; but there is in the case of chattels not specific—for example, when a job-master lets a carriage. In policies of insurance and in charter parties the word 'warranty' is used in the sense of 'condition.' In the case of chain cables a warranty that the cable has been legally tested and stamped is implied (Chain Cables and Anchors Act, 1874).

Warraus, or GUABARAUNOS, the aborigines of the Guiana seaboard, who were mostly driven out by the intruding Caribs and Arawaks, and only a few small groups now survive on the coast of British and Dutch Guiana. In this watery domain they live in frail, leafy huts, raised on piles or in the branches of trees high above the periodical floods, and occupied almost exclusively with fishing. They speak a stock language unrelated to any other.

Warren. In England a right of warren or free warren is a franchise obtained by royal grant or prescription, and may either be appurtenant to the land to which it applies, or be owned in gross as an incorporeal hereditament. It is a right of property in certain kinds of game, and the beasts and birds to which it applies are hares, rabbits, roes, partridges, pheasants, woodcock, quails, rails, mallards, and herons, and perhaps some others, but not grouse. In ordinary non-legal language a warren is a breeding-place for rabbits.

Warren. (1.) Town, cap. of Trumbull co., Ohio, U.S.A., on the Mahoning, 53 m. S.E. of Cleveland; has machine shops, rolling mills, and flour mills; coal and iron are mined. Pop. (1900) 8,529.

(2.) Town, cap. of Warren co., Pennsylvania, U.S.A., on the Allegheny, 50 m. E.S.E. of Erie; has oil-refining, engine and boiler-making. Pop. (1900) 8,043.

Warren, SIR CHARLES (1840), British general, born at Bangor in N. Wales. He was special commissioner for the settlement of the boundary between the Orange Free State and Griqualand West (1876-7), and his impressions of those countries and their peoples were recorded in his *On the Veld in the Seventies* (1902). He held the command of the Diamond Fields Horse in the Kaffir war (1877-8), and of part of the Griqualand West Field Force in the Griqua rising (1878). He brought to justice the murderers of Professor Palmer and his party during the Egyptian war (1882), and conducted successfully the Bechuanaland expedition (1884-5). From 1886-8 he was Chief Commissioner of the Metropolitan Police. On the outbreak of the Boer war he went out to S. Africa in command of the Fifth Infantry Division, and in the second attempt to raise the siege of Ladysmith crossed the Tugela (Jan. 18, 1900), attacked the Boers' right flank on the 21st, and on the 23rd captured Spion Kop. The position was held during the 24th, but after severe fighting and heavy British losses, was evacuated in the early hours of the 25th. Lord Roberts subjected Warren's action

to severe criticism. In 1867-70 Warren was engaged on excavation work at Jerusalem and in Palestine, and in that connection wrote *Underground Jerusalem* (1874), *The Temple or the Tomb* (1874), and *Jerusalem* (1884).

Warren, GOUVERNEUR KEMBLE (1830-82). American general, born at Cold Spring, New York; was assistant professor of mathematics at West Point (1859-61), and in the civil war was engaged in the battles of Manassas, Antietam, Fredericksburg, Chancellorsville, and Gettysburg; commanded at Auburn and Bristol, and distinguished himself in the Richmond campaign and the siege of Peters-

land. In 1806 he captured the *Marengo* and the *Belle Poule*. He became a full admiral in 1819.

Warren, LEICESTER. See DE TABLEY.

Warren, SAMUEL (1807-77), Welsh novelist, born in Denbighshire; was called to the bar in 1837. He became Queen's Counsel (1851), and recorder of Hull (1854-74), and for a short period (1856-9) sat in the House of Commons. But Warren's ambitions were literary rather than legal. His best-remembered works appeared first in *Blackwood's Magazine*—viz. *Passages from the Diary of a late Physician* (1832), and *Ten Thousand a Year* (1841).

on E. and Prussia on W. Area, 5,623 sq. m. The surface is almost level. The whole government belongs to the Vistula basin, largely through the W. Bug. Marshes are extensive in the centre. The chief mineral deposit is salt. Fruit culture is active. Industrially, Warsaw ranks second in Russian Poland. The larger industrial establishments include sugar-refineries, steel and other metal works, tanneries, distilleries, breweries, flour mills, and manufactories of tobacco, soap, and candles, and of cloth, silk, and flax stuffs of all kinds. Trade is very active. Of the population, 75½ per cent. are



Warwick and Warwick Castle.

1. Warwick Castle. 2. Leicester Hospital and West Gate. 3. East Gate. (Photos 1 and 2 by Rook Bros.)

burg. He resigned his command owing to a quarrel with Sheridan over the battle of Five Forks. He wrote *Explorations in the Dakota Country* (1856), and *Explorations in Nebraska* (1858).

Warren, SIR JOHN BORLASE (1753-1822), British naval officer, saw service with Howe and Sir Charles Hardy in N. America. On April 23, 1794, a force under his command captured the *Pomone*, the *Babet*, and the *Engageante*. In 1796 he kept the whole Atlantic coast of France in alarm, and captured, drove ashore, or destroyed numerous vessels. In 1798 he was instrumental in annihilating a French expeditionary squadron designed for Ire-

land. Other works are *Now and Then* (1847), and *The Lily and the Bee* (1851).

Warrington, munic., parl., and co. bor., Lancashire, England, on the Mersey, between Manchester and Liverpool. The church has a Saxon crypt. The town has iron manufactures. Pop. (1901), munic. bor., 64,242.

Warrnambool, seapt. tn., Villiers co., Victoria, on Southern Ocean, 166 m. s.w. of Melbourne; is the third port in the state, and the terminus of the railway from Geelong. It has two parks and botanical gardens. Pop. (1901) 6,410.

Warsaw. (1.) Government, Russian Poland, between Siedlee

Roman Catholics and Poles, 16½ per cent. Jews, 7 per cent. Protestants (mostly Germans). Pop. (1897) 1,933,689. (2.) City, cap. of gov. of same name, Russian Poland, formerly capital of kingdom of Poland, mainly on l. bk. of Vistula, 320 m. E. of Berlin. The Palace Square, near the river, is the centre of city life, and there are other fine squares or gardens; the Uyazdovsk and Jerusalem boulevards are particularly fine. The cathedral of St. John dates from 1360, and a Russian cathedral is in course of construction. The palaces are now put to municipal use; the Casimir Palace is occupied by the university, which

is attended by over 1,500 students. Iron and steel goods, machinery, carriages, plated goods, and boots and shoes are manufactured. Trade is carried on in grain, leather, sugar, and coal; the wool and hop fairs are important. Warsaw was the residence of the dukes of Mazovia till 1526. In 1609 it superseded Cracow as the capital of Poland. It was taken by the Swedes in 1655 and 1656, and was captured by the Russians in 1764 and 1794. In 1807 it was made capital of the duchy of Warsaw, and in 1813 came entirely under Russian rule. After an insurrection lasting from Nov. 29, 1830, to Sept. 8, 1831, Warsaw capitulated. The city was the scene of much rioting and bloodshed during 1905-6. Pop. (1897) 638,208 (about one-third Jews).

War Stores Commission.

The publication of the Butler War Office Committee Report on Sales and Refunds to Contractors in Africa at the end of the war led to the appointment of a royal commission to investigate the whole of the circumstances. The investigation is not yet completed (August 1906), but it has already revealed an appalling amount of mismanagement and waste.

Wart, or **VERRUCA**, a papillary outgrowth from the skin, sometimes due to the debility of youth or old age, and frequently associated with dirt and neglect. A wart consists of enlarged vascular papillæ, each enclosed in a sheath of thickened cuticle. It is usually sessile, but upon the scalp is often pedunculated. On the fingers warts are generally isolated and large; on the wrists, hands, and scalp they are apt to develop in crops. In elderly people epithelioma frequently attacks a simple wart, which thus becomes a centre of malignant disease. Each wart may be painted with acetic acid daily, or touched with a saturated solution of caustic potash. When large crops of warts are present, tonics and liquor arsenicalis should be given internally. In all cases cleanliness is of importance.

Wartburg. See EISENHART.

Wart-hog (*Phacochoerus*), a genus belonging to the pig family, with two species, peculiar to Africa. The wart-hogs are characterized by their very large heads, which bear large wartlike processes at the sides. The tusks are greatly developed, those of the upper jaw being considerably larger than those of the lower. In the young there are thirty-four teeth; but in the adults the incisors and anterior cheek teeth tend to disappear, leaving only the large tusks and the last molar in each side of each jaw. This last molar, how-

ever, becomes greatly enlarged, and is of exceedingly complex structure. Another peculiarity of the wart-hogs is the mane of long hair on the neck and back, while the rest of the body is nearly naked. In habits the wart-hogs resemble pigs. Two species are known—*P. africanus*, which is widely distributed over the continent; and *P. pallasi*, confined to S.E. Africa.



Wart-hog.

Warton, JOSEPH (1722-1800), English poet and critic, was born at Dunsfold, Surrey. He and Collins projected a joint collection of odes, but in fact published their works separately—Warton (1746). Warton's verses *To Evening—Hail, meek-eyed maiden!*—are now perhaps the only lines of his that are remembered. After holding some livings he went to Winchester as second master, and was headmaster (1766-93). Both in his *Odes* and in an *Essay on Pope* (1756) he vindicated the claims of the imaginative poetry of the Elizabethans and of Milton. These views he repeated later in life in his edition of *Pope* (1797). He is also known as one of the many editors and translators of Virgil. See *Woolf's Life* (1806).

Warton, THOMAS (1728-90), brother of Joseph, born at Basingstoke, and became fellow of Trinity College, Oxford. Mason having attacked the University of Oxford in *Isis, an Elegy*, Thomas Warton replied (1749) with the *Triumph of Isis*, with taste, spirit, and success. His merit is that of the pioneer. Like Gray, he fixed his ultimate choice upon the wild and the romantic; he resembled Gray, also, in his passion for mediæval research. The spirit of romanticism was, in fact, reviving; Warton's *History of English Poetry* (1774-81) gave it a fresh impulse, in conjunction with Percy's *Reliques*. Warton had published his *Observations on the 'Faerie Queene' of Spenser* in 1754; and in 1757 he was appointed professor of poetry at Oxford, and held the office for the usual term of ten years. Of his professorship the *Dissertation on Theocritus*, prefixed to his edition of the poet, was the only fruit. He was poet laureate from 1785 to his death. He wrote the

biographies of Sir Thomas Pope and Lord Bathurst. He was a man of convivial spirit, somewhat slovenly, and with some unclerical tastes. He was a friend of Johnson and his circle; yet between him and Johnson there grew up an estrangement. See *Mant's Life* (1802).

Warwick, munic. parl. (with Leamington), and co. bor., Warwickshire, England, on the Avon, 21 m. S.E. of Birmingham. The church of St. Mary retains 12th to 15th century work, and has a monument to Beauchamp, Earl of Warwick and his countess (d. 1396). The church of St. Nicholas is also ancient. Agricultural implements and gelatin products are manufactured. The town ranked as a borough from the time of Edward the Confessor. At Blacklow Hill, in the vicinity, Piers Gaveston was beheaded in 1312. The fine baronial castle, situated on a rocky eminence above the Avon, is said to have been founded by Elfleda, daughter of king Alfred. It was mainly rebuilt, in the time of Edward III., by Beauchamp, Earl of Warwick, and his son. In 1642 it was unsuccessfully attacked by the royalists. It contains valuable art collections, including works by Rubens and Van Dyck. An annual pageant is held representing episodes in English history associated with the town. Pop. munic. bor. (1901) 11,889.

Warwick, tn., Kent co., Rhode I., U.S.A., on Narragansett and Cowes Bays, 12 m. S.W. of Providence; has manufacture of cotton goods. Pop. (1900) 21,316.

Warwick, tn., Queensland, 166 m. S.W. of Brisbane by rail, on the Condamine R. Wine-making, bacon-curing, tanning, flour-milling, coal-mining, and cheese-making are carried on. Pop. (1901) 3,836.

Warwick, GUY OF. See GUY OF WARWICK.

Warwick, RICHARD NEVILLE, EARL OF (1428-71), known as the 'king-maker.' His father was Richard Neville, Earl of Salisbury (1400-60), and he married Anne, daughter and heiress of Richard de Beauchamp, Earl of Warwick, and was himself created Earl of Warwick (1449). To his position as a member of the powerful family of the Nevilles, and to the prestige of great landed possessions, Warwick added the personal advantage of a winning presence and unusual talents. He was vastly popular, and dispensed a boundless hospitality. Warwick learned the game of war on the Scottish marches. In 1455 he joined the forces of the Duke of York, and contributed greatly to the victory at St. Albans. He was rewarded with the governorship of Calais,

and shortly after with the command of the seas. In 1459 Warwick was again fighting for York. Worsted in Kent, he retired to Calais; but in June 1460 he was back in Kent, with thousands flocking to his standard, and combining forces with Edward Earl of March, he again prevailed, and Edward was proclaimed king at London on

porary reconciliation followed. In 1470 the quarrel broke out afresh, and again was patched up. But shortly after Warwick entered into a compact with the queen, Margaret, and landed at Plymouth, where he proclaimed Henry vi. king. Edward escaped to Holland, and Henry was triumphantly crowned at St. Paul's. Warwick was now for a few

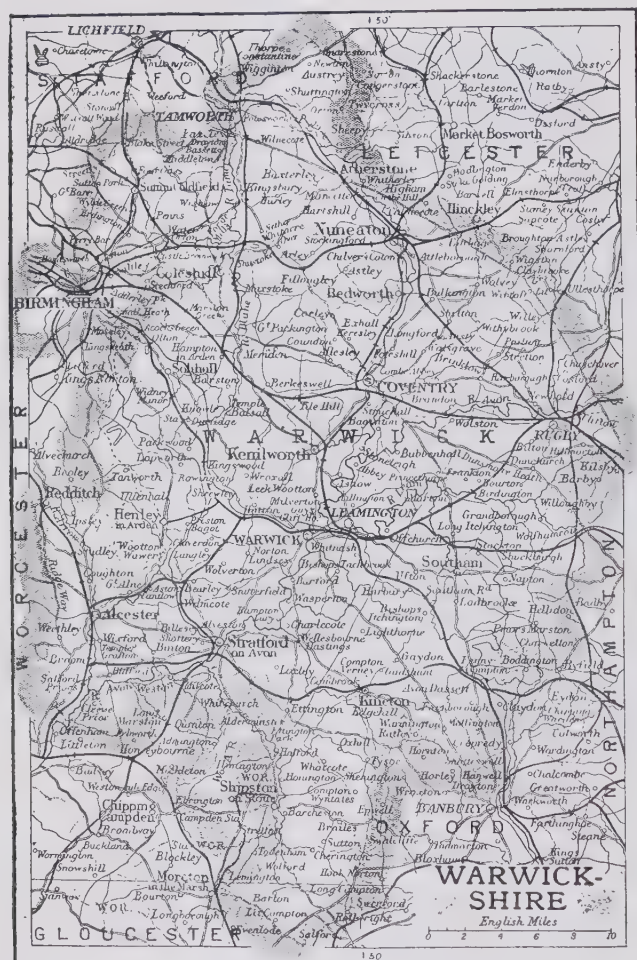
Tame. A large area is under pasture. Coal is extensively mined (nearly 3½ million tons in 1904), and there are quarries of diorite (Atherston, Nuneaton) and limestone. The manufactures include heavy iron goods, hardware, firearms, jewellery, etc. (Birmingham), ribbons, watches, bicycles, motor cars (Coventry). The county returns four members to Parliament. Ancient roads are Watling Street on N.E., Foss Way, and Icknield Street. Area, 563,097 acres. Pop. (1901) 347,722.

Wasatch, a range of mountains in Utah, U.S.A., a spur of the Rocky Mountain system, separating the waters which drain into the Colorado from those flowing into Great Salt Lake. A few peaks in the range exceed 10,000 ft. in altitude.

Wash, THE, estuary, E. coast of England, between Lincoln and Norfolk, receives the Witham, Welland, Nen, and Ouse. It is beset by numerous sandbanks, dry at low water. The shores are low and at times inundated. Length, 22 m.; breadth, 15 m. In 1751 Nathaniel Kinderley proposed to unite (1) the Welland and the Witham, and (2) the Nen and the Great Ouse, and to make the former empty, by means of a new channel, at Wrangle or Friskney, and the latter, by a similar channel, at Snettisham. By this it was expected that some 100,000 ac. would be reclaimed. Sir John Rennie advocated that the four rivers should be united into one common channel, and the land be embanked as it 'accreted.' This was expected to give 150,000 ac. About 1850 the Norfolk Estuary Company began the reclamation of 30,000 ac. at the mouths of the Ouse and the Nen, and in 1851 the Lincolnshire Estuary Company began to reclaim other 30,000 ac. between the Witham, Welland, and Nen; but neither project was carried out.

Washburn, CADWALLADER COLDEN (1818-82), American soldier and politician, was born at Livermore, Maine. He sat in Congress in 1855-61 and 1867-71. During the civil war he served under Curtis at Grand Coteau; was major-general of volunteers at Vicksburg; commanded the 13th corps in Texas—capturing Fort Esperanza on Matagorda Bay (1863)—and the war district of Tennessee (1864-5). Prospering as a flour-miller (Minneapolis) and lumberer, he founded Washburn Observatory (Wisconsin university, 1873).

Washburne, ELIHU BENJAMIN (1816-87), American statesman and diplomatist, was secretary of state in Grant's first cabinet (1869); represented his



March 4. During the next few years Warwick steadily subdued the strongholds which still held by the house of Lancaster. He conducted Henry a prisoner to the Tower in June 1465. The next year an insurrection in Yorkshire and the defeat of the royal forces at Edgecote threw King Edward into Warwick's hands. But the barons compelled him to liberate the king, and a tem-

months supreme. But Edward landed on Mar. 14, 1471, at Ravenspur, gathered an army, and at the battle of Barnet Warwick was slain. Thus passed an intrepid and masterful but fatally restless man.

Warwickshire, midland co., England. Surface diversified, but with no great elevations (Broom Hill, 830 ft.). The principal rivers are the Avon, Stour, and

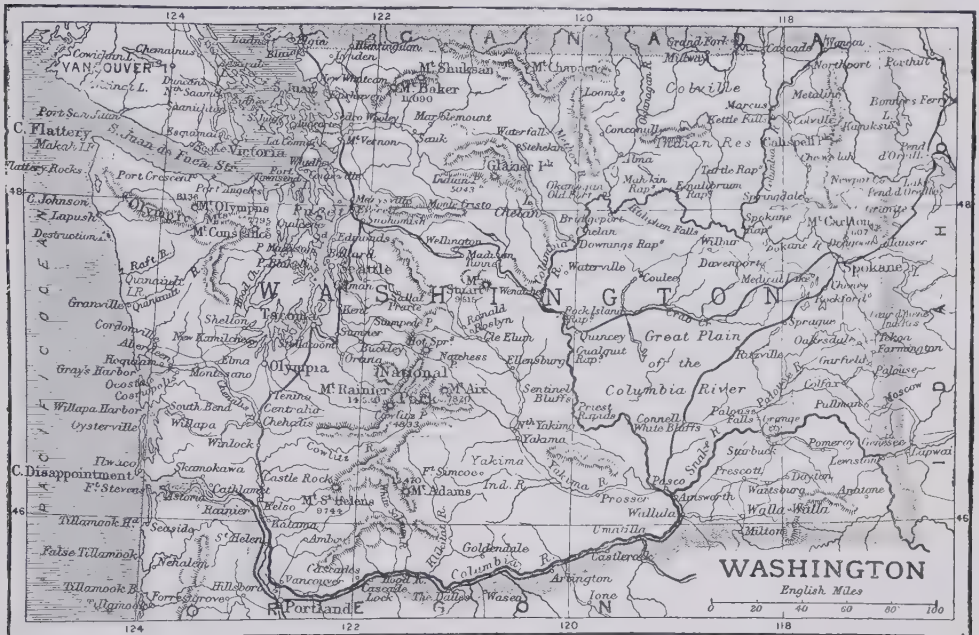
country at Paris in the Franco-German war; sat in Congress sixteen years from 1853, winning a reputation as a keen economist, and styled 'the watchdog of the treasury.' He refused to run for president (1880), and wrote *Recollections of a Minister to France* (1869-77), *History of the English Settlement in Edwards Co., Illinois* (1882), and *The Edwards Papers* (1884).

Washhouses. See BATHS AND WASHHOUSES ACTS, and LAUNDRIES.

Washington. (1.) State in extreme N.W. of the United States, organized as a territory in 1853, and admitted as a state in 1889. It has an area of 69,180

reaches an altitude of 8,140 ft. Both this group and the Cascade Range contain many small glaciers. The northern part of the country E. of the range is mountainous. The central and southern parts consist of the great plain of the Columbia. In the western part of the state the rainfall ranges from 50 to 100 in. annually, and it is in consequence covered with dense, magnificent forests of Coniferae. The eastern part has a light rainfall. The principal river of Washington is the Columbia, which enters it on the N. from British Columbia. The Snake, its main branch, enters the state at the S.E. corner. Apart from the lumber and

on the bottom lands, in an amphitheatre surrounded by bluffs, above which a part of the residential portion has spread. The city is coextensive with the district of Columbia, and includes 60 sq. m. The street plan is regular and symmetrical, radiating from the Capitol. The streets and avenues are wide (90 to 160 ft.). The water supply is taken from the Potomac at Great Falls, 18 m. above the city. The total area of public parks is 3,600 ac. Many entire squares are laid out as parks. The grounds surrounding the Capitol, the Botanic Gardens, the Smithsonian Institution, the Agricultural Department, and



sq. m., and borders on the Pacific Ocean on the w. It is divided by the summit of the Cascade Range (6000-7000 ft.) into two unequal parts, differing widely in climate and vegetation. Upon and near the range rise volcanic cones—e.g. Mts. Baker (10,790 ft.), Rainier (14,526 ft.), Adams (9,570 ft.), and St. Helens (9,750 ft.). West of the Cascades is a depression or valley, occupied in the N. by Puget Sound, while the S. is drained by several streams. Separating this valley from the Pacific coast are the Coast Ranges. In the S. these are low; but between Puget Sound and the coast they rise into the Olympic Mts., whose highest summit, Mt. Olympus,

probably the fishing industry, agriculture is by far the most important interest in the state. Trees of from 12 to 15 ft. in diameter, and 300 ft. in height, are not uncommon. The lumber mills are situated mainly upon the shores of Puget Sound. Gold and silver are obtained in small quantities, and coal in considerable amount near Puget Sound. Pop. (1900) 518,103, of whom more than one-fifth were of foreign birth. Olympia, the capital, is on Puget Sound. (2.) City and cap. of the United States, is situated on the I. bk. of the Potomac, at the head of tide and navigation, in lat 38° 53' 25" N., and long. 77° 00' 34" W. Most of the city has been built

the Washington Monument, are included in the park area; and in the suburbs are the grounds of the National Soldiers' Home, the Zoological Park, and Rock Creek Park, which includes many miles of the picturesque valley of Rock Creek. The city contains many libraries, the largest being the library of Congress, installed in a magnificent new building, which cost over £1,200,000; it contains upwards of 800,000 books and 250,000 pamphlets. There is also a municipal or public library, newly housed in a beautiful white marble building given by Mr. Andrew Carnegie. Chief among the institutions for higher education is the Carnegie Institution (1902).

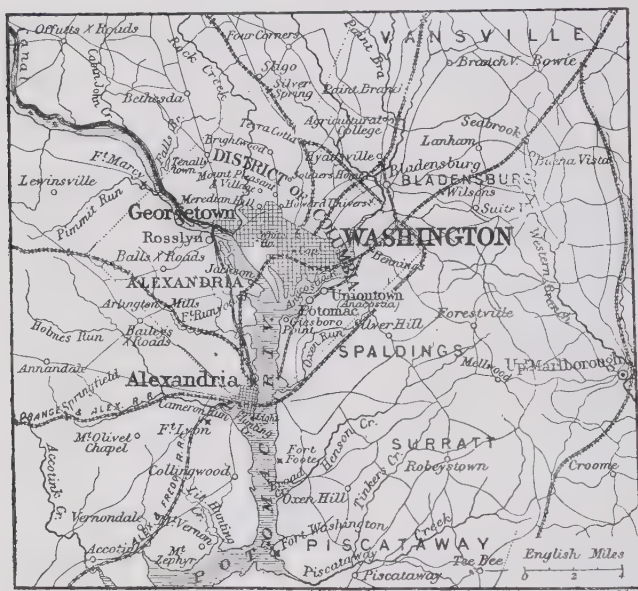
There are also two Roman Catholic institutions (the Roman Catholic University and Georgetown College), a Methodist university, Columbian University, and a Baptist institution. Washington is not a commercial or manufacturing city, but exists solely as the capital of the nation, and as an attractive residential city. The Capitol occupies a commanding position near the centre of the city, and covers three and a half acres of ground. It is 751 ft. in length, and 324 ft. in greatest breadth, and, with its great dome, has a height of 299 ft. It cost £3,200,000. To the N.W. are the Treasury, the White House, and the State, War, and Navy building, while between this group

Washington. (1.) Town, cap. of Daviess co., Indiana, U.S.A., 96 m. S.W. of Indianapolis; has railway workshops. Coal and fireclay are mined. Pop. (1900) 8,551. (2.) Town, cap. of Fayette co., Ohio, U.S.A., 37 m. S.W. of Columbus, is an important railway centre. Pop. (1900) 5,751. (3.) Town, cap. of Washington co., Pennsylvania, U.S.A., 25 m. S.W. of Pittsburgh, is the seat of the Washington and Jefferson Presbyterian college (1802). Iron and steel goods, glass, carriages, and flour are manufactured. Pop. (1900) 7,670.

Washington, GEORGE (1732-99), first president of the United States of America, came of an old English stock, and was born at

against the British. At the close of 1758 he retired from active service. A wealthy marriage, and the inheritance from his half-brother of the Mount Vernon estate in Virginia, made him now a rich man.

Washington had expressed his strong dissatisfaction at the Stamp Act of 1765, and in 1773 supported the resolution for a committee of intercorrespondence between the colonies. He represented Fairfax county at the convention which met at Williamsburg in August 1774, and was appointed by the convention one of the six Virginian delegates to the first Congress. In 1775 Congress elected him commander-in-chief of the colonial army, the colonies being then practically at war with the mother country. The only British general who might have matched Washington, Lord Cornwallis, was ill-supported by his colleagues, and was unable to act effectively. Washington's army of some 17,000 men was ill-found, ill-drilled, and honey-combed with discontent; but matters speedily righted themselves under his supervision. In 1776 the colonists drove the British out of Boston, and though they were compelled to fall back from New York, they rallied and retook what they had lost before the year was finished. Washington then remodelled his army, and enlisted men for a period sufficiently long to make soldiers of them. The campaign of 1777 commenced adversely to the Americans. They were defeated on the Brandywine and at Germantown, and lost Philadelphia. In 1778 Washington was better prepared for action, and a general attack compelled the British to retreat from Philadelphia. During 1779 he retained the positions he had won by the Hudson, and though a few of the coast towns were burned, he was able to protect New Jersey. In 1777 a treaty was made with France, by which the Americans were aided with both troops and supplies; but the combined forces made little headway against the naval superiority of the British until 1781, when the French and Americans completely invested Lord Cornwallis at Yorktown in Virginia, and compelled him to capitulate (October 19). This practically brought the war to an end; peace was proclaimed, and the British finally evacuated New York on Nov. 25, 1783. On the 23rd of December following, Washington resigned his commission to Congress. In 1789 he was elected president by the unanimous vote of the nation. His journey to New York was a continual triumph. To enormous energy Washington added the



Washington City and Neighbourhood.

and the Capitol is the Interior Department. The Post Office Department occupies a handsome building on Pennsylvania Avenue, near the last mentioned; while S. of that thoroughfare are the Smithsonian Institution, the Agricultural Department, and the tall shaft (555 ft.) of the Washington Monument. The Naval Observatory stands N.W. of the city.

The district of Columbia is governed by three commissioners, appointed by the president of the United States, who also appoints the judges and other officers of the courts. Pop. (1900) 278,718. The number of foreign-born was 20,119, or 7.2 per cent. The number of negroes was 36,702, or 31 per cent.

Brigades Creek, in Westmoreland co., Virginia. In 1753 Governor Dinwiddie selected Washington to act as commissioner to the French on the Upper Ohio. In 1754 he was appointed second in command of the Virginia forces sent against the French, and, after the death of Colonel Fry, found himself in chief command. He conducted a masterly retreat before the overwhelming French force which was sent to avenge Jumonville's defeat. In 1758 he was busy reorganizing the ill-drilled and badly-provided provincial militia. The necessity for intrenching himself on the Ohio frontier against superior French forces taught him lessons which were not forgotten in his war



Views in Washington.

1. National Museum. 2. White House, interior. 3. White House, north front. 4. The Capitol. 5. Smithsonian Institution. 6. Offices of the War and Navy Department. 7. Congress Library. (Photos by N. P. Edwards.) 8. City Hall. (Photo by Frith.)

cool brain of the man of business, an inflexible sense of justice, a personal disinterestedness of the rarest kind, and an unbendable will. His imposing figure and grave, masterful face became identified in the minds of the people with the nation. He was unanimously re-elected to the presidency in 1793. After the division of Congress into parties—Federalists and Democrats—took place, Washington strove to maintain what concord was possible between them. He

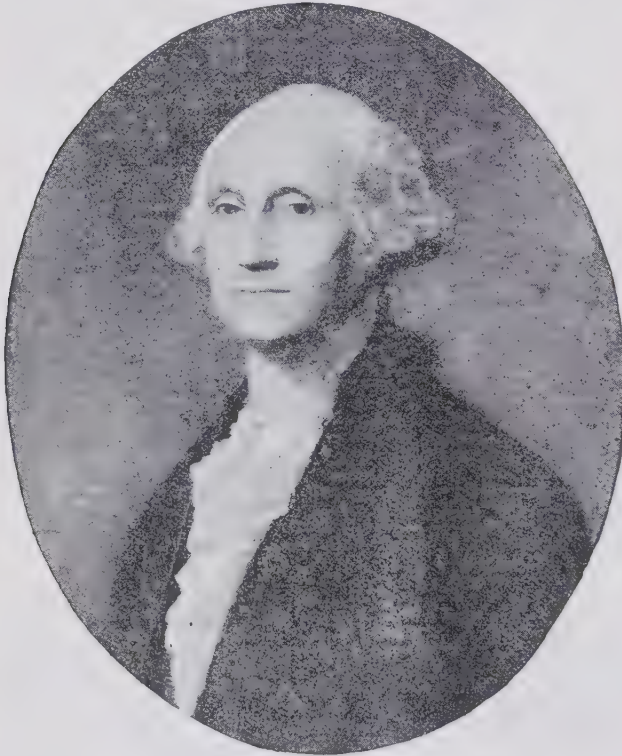
with office, Washington retired at the close of his term, and would not be persuaded to be renominated. He had no children, and none can claim direct descent from him. His writings have been issued by W. C. Ford (14 vols. 1888, etc.), and his *Life* written by Washington Irving (5 vols. 1855-9), and H. C. Lodge, in *American Statesmen Series* (1889).

Washington, TREATIES OF.
(1.) That fixing the boundary of British America and the United

committed by any one within its territory—May 8, 1871.

Washita, or OUACHITA. See OUACHITA.

Wasp, a name applied to two divisions of the Hymenoptera—the Diptera, or true wasps, and the Fossorial, or fossorial solitary wasps. In both groups the body is less hairy than in bees, and the hairs are never plumose; the tarsus of the hind-leg is formed exclusively for walking, and is not modified as in bees. The true wasps are either solitary or social. Of the solitary forms, mention may be made of the genus *Eumenes*, of which *E. coarctata* is British; and the genus *Odynerus*, of which fifteen species are British. These wasps construct small nests either in a burrow or attached to trees or walls, which are stocked by the mother wasp with animal food. The social wasps belong to the family Vespidae, the common genera being *Vespa*, which includes all the British species, and *Polistes*. In all cases the habits are very similar. In the spring a queen wasp emerges from the place where she has spent the winter, and proceeds to construct a nest. This at first consists of only a few incomplete cells, in each of which an egg is laid. These eggs soon hatch, and the time of the queen is occupied in feeding the young, at first with vegetable food, such as nectar or fruit pulp, and later with insects. The larvæ develop rapidly, and emerge from the cells as worker females. These workers relieve the mother of the task of feeding the larvæ, and the nest grows rapidly in size by the addition of new cells. As the wasps are very sensitive to cold, the nest is enveloped in a papery substance, apparently to maintain a high temperature. It is this sensitiveness to low temperatures which is the cause of the great variation in the number of wasps in different seasons, a very cold spring leading to a great reduction in the number of the wasps of summer. About August cells of larger size are constructed, and in these fertile males and females are produced. These leave the colony and mate; after the pairing the males die, while the females (or a proportion of them) seek shelter for the coming winter, each starting a new colony in spring. The original colony, after the production of the fertile forms, rapidly dies off, the remaining larvæ being first destroyed by the workers. Even in the tropics the colonies die off in the same way. The nest is never used for more than one season. In India *Vespa velutina* is stated to construct a nest which reaches a length of several feet. Of the



George Washington.
From a Portrait by Gilbert Stuart.

also threw the whole weight of his influence into the preservation of America's neutrality in the contests which convulsed Europe. He was in favour of moderation. This almost lost him his popularity. When he appointed Jay as envoy to the court of Great Britain, the strong anti-British sentiment in America wrought suspicion and discontent. There were violent scenes in Congress, and a weaker man might have been overthrown. But Washington then, as always, made his will prevail against all objectors. Thoroughly wearied

States, June 12, 1846. (2.) The 'Reciprocity' Treaty, regulating the trade with Canada, June 7, 1854. (3.) The treaty referring the *Alabama* claims and the San Juan boundary question to arbitration; settling disputes with regard to fisheries; asserting that it is the duty of a neutral state, which desires to remain at peace with belligerents, and to enjoy the rights of neutrality, to abstain from affording any military aid to one or both of the belligerents, and to take care that no acts which would constitute such co-operation in the war be

British forms, *V. crabro*, the hornet, frequently places its nest in a hollow tree; the common wasp (*V. vulgaris*) nests underground; while the wood-wasp (*V. arborea*) and its allies suspend theirs from the branch of a tree or shrub.

The sting of wasps, and especially of the hornet, is severe, but the insects do not sting unless provoked. If the nest be interfered with, however, they display great fury, and will follow the attacker for a long distance. Though wasps cause a considerable amount of destruction to fruit, they also destroy a large number of insects.

The fossorial solitary wasps have not the fold in the anterior wings possessed by the true wasps. Their habits are very diverse, though *Sphex* is a type of a very large family. Another interesting family is that of the Pompilidae, whose members chiefly prey upon spiders, especially the poisonous forms. To these families belong the sand wasps, which dig their burrows in sand and stock their nests with insects. In S. America occurs the genus *Pepsis*, whose members may reach a length of over two inches, and have a very powerful sting; they attack and overcome the large bird-catching spider (*Mygale*). See Lubbock's *Ants, Bees, and Wasps*; Camb. Nat. Hist., 'Insects,' vol. ii.; Peckham's *Instincts, etc., of Solitary Wasps* (1898); De Saussure's *Monographie des Guêpes sociales* (1853-8); and G. W. and E. G. Peckham's *Wasps, Social and Solitary* (1905).

Wasp, a British steam gunboat, which was lost in September 1887 while on a passage from Singapore to Hong-kong, all on board—seventy-three officers and men—perishing.

Wassail, a spiced beverage prepared from roasted apples, sugar, toast, nutmeg, other spices, and old ale. During the Anglo-Saxon and early English period wassail played an important part on all great festive occasions.

Waste. A tenant-for-life may not commit waste—that is to say, speaking generally, he may not do any act which will diminish the capital value of the estate. Waste is voluntary or permissive. Voluntary waste consists in doing active acts of waste—e.g. pulling down the manor house, opening mines, or ploughing up meadow land. Permissive waste consists in allowing buildings to get out of repair. A tenant-for-life is often by the terms of his holding not punishable for waste; but even then he is not allowed to commit equitable waste, which consists in spiteful or wilful acts damaging the estates—e.g. cutting down ornamental timber, or despoiling

• a family mansion. The remedy for waste is an action for damages, or for an injunction to restrain the acts.

Watch, the period of time that each portion of a ship's crew is on duty. The seven watches of the log-book are:—From 8 p.m.

duty are made uneven in number by means of the dog watches, in order that each man may have a different time for duty on successive days. The master's watch is called the starboard, and the mate's the port watch. In a British man-of-war, where the



Wasps and their Nests.

1. *Eumenes coarctata* and nest. 2. *E. xanthura* and nest. 3. *Odynerus spinipes* and group of nests on bank. 4. *Vespa crabro* and nest in tree. 5. *V. germanica* and nest in ground, partly uncovered to show combs. 6. *V. norwegica* and nest in tree, showing combs. 7. *Sphex argentatus*. 8. *Pepsis elevata*. 9. *Icaria* and nest on branch. 10. *Apocia pallida* and nest on tree. 11. *Pelodytes chalybeus* and nest. 12. *P. tactus* and nests.

to 12 midnight, first watch; 12 to 4 a.m., middle watch; 4 to 8 a.m., morning watch; 8 to 12 noon, forenoon watch; 12 to 4 p.m., afternoon watch; 4 to 6 p.m., first dog watch; 6 to 8 p.m., second dog watch. The turns for

crew is commonly divided into three watches, a lieutenant is officer of the watch, and has charge of the ship, subject to the captain's directions, during the time. The watches and hours at sea are marked by bells, one tap

for every half-hour, and a pair for each hour of the watch, eight bells marking the end of each watch.

Watch. See HOROLOGY.

Water, H_2O , a compound of one volume of oxygen gas with two of hydrogen, the proportions by weight being 8 of the former to 1 of the latter. It occurs in vast quantities in nature in the solid, liquid, and gaseous states, covering no less than two-thirds of the surface of the globe. It constitutes about seven-eighths of the animal body and nine-tenths of many plants, whilst it is also present in many minerals. Water is formed in many chemical actions—for example, by the combustion of hydrogen and its compounds; but when required practically, it is either used in its natural state or after purification by distillation. At ordinary temperatures water is an odourless, faintly greenish-blue liquid. It boils at $100^{\circ}C$. under normal pressure, and freezes with expansion at $0^{\circ}C$., the former change requiring an expenditure of 536 calories per gram, and the latter the removal of 80 calories. Water is most dense at $4^{\circ}C$., expanding with rise and fall of temperature, 1 c.c. at this point weighing 1 gram. It is very incompressible, a bad conductor of heat and electricity, and is taken as a standard of comparison in determination of specific heat and specific gravity, and in settling the unit of temperature. Water has great solvent power, apparently merely mixing with the substance in some cases, dissociating it into ions in others, or forming hydrates with it in still other cases. Chemically, water is neutral, but enters easily into many chemical actions: thus it forms acids with anhydrides, has its hydrogen displaced by sodium and other metals, and enters into combination with many salts to form compounds containing water of crystallization. It also seems to play an important part in chemical action: many substances that react vigorously in presence of water refuse to do so in its entire absence.

Natural Waters.—Rain water, if collected on a clean and insoluble surface in the country, is, except for a little dust and some air gases, practically pure; the same is almost equally true if it falls on rocks like granite or slate and the soils derived from them. A considerable difference is, however, observed if the rock or soil contains organic matter, common salt, calcium sulphate, calcium or magnesium carbonates, or other soluble components. It is true that the carbonates of calcium and magnesium are not soluble in pure water, but rain

water which has dissolved carbon dioxide from the air and surface soil can freely dissolve them, calcium and magnesium bicarbonates being formed. These bicarbonates, as well as calcium sulphate or chloride, render the water 'hard'—i.e. hinder it from lathering with soap. (See WATER-SOFTENING.) Besides carbon dioxide, natural waters contain dissolved air, which improves the taste, oxidizes organic impurities, and supplies the oxygen for the respiration of fish. Table I. shows the number of grains per gallon of solid impurities in typical natural waters.

Water for Domestic Use.—For drinking, water should not be too soft, and must not contain much magnesium compounds, or be able to dissolve lead. Table II. shows

filtering water on a large scale is fine sand, but it must be frequently renewed if the filtration is to be efficient. Professor P. Frankland has shown that the system of sand filtration adopted by the London water companies, drawing their supply from the polluted Thames, is capable of reducing the number of micro-organisms present in the original water on an average 97.7 per cent. The amount of reduction is proportional to the thickness of the sand layer and the slowness of filtration. But the ordinary domestic filter is more often a source of danger than the reverse, the filtering material becoming clogged with impurities, and then, instead of removing them, it adds them to the water passing through it. A domestic filter

Table I.

	River Trent.	River Dee.	Loch Katrine.
Calcium carbonate	32	85	35
Calcium sulphate	21.55	12	64
Magnesium carbonate	5.66	36	
Sodium chloride	17.63	72	79
Silica	72	14	10
Iron and alumina	50	06	
Organic matter	3.68	1.64	80
	50.06	3.89	2.68

Table II.

	Good Water.	Bad Water.
Total solid residue	12.35	38.65
Volatile residue	2.07	6.83
Free and saline ammonia	0.0014	0.025
Albuminoid ammonia	0.005	0.015
Chlorine	1.66	5.98
Nitrogen as nitrates	0.00	0.89

typical analyses of a good and a bad water, the figures being given in grains per gallon. The organic matter, which is represented by the ammonia, albuminoid ammonia, chlorine, and nitrates, includes all those substances which a water may derive from animal or plant products. The diseases carried by water are due to specific micro-organisms, which live and flourish in impure water. The mere presence of sewage matter would not render the water dangerous for drinking purposes. It is what accompanies or might accompany the sewage that is the dangerous element, and this can only be definitely settled by bacteriological examination.

One of the commonest methods of purifying water is to filter it. One of the best materials for

should therefore be frequently cleaned, and the filtering material renewed at least once a year.

Even on the large scale filtration may be ineffectual in rendering a dangerously polluted water safe for drinking purposes, though treatment with ozone appears from recent experience to be a safe but expensive method of preventing the propagation of disease.

On the small scale there is every reason to believe that a few minutes' boiling will destroy all organized organic matter in a water except the spores of a few bacteria, which in all probability are not disease-producing. Boiled or distilled water, however, has no air in it, and is in consequence flat and insipid, and some system of aeration should be adopted to overcome this.

Some waters, if passed through lead pipes or stored in leaden cisterns, take up a sufficient quantity of the metal to cause poisoning. The exact conditions which favour the solution of lead in water are not as yet fully understood, but soft waters and those containing much organic matter along with nitrates are more liable to lead contamination than hard waters.

Water for Technical Purposes.—For steam-raising purposes a hard water is unsuitable, as the earthy carbonates and sulphates are precipitated in the boiler, and form what is technically known as 'scale.' Magnesium chloride is also objectionable, because it has a corroding action on the boiler plates. Hard water is also objectionable to the textile worker, as it precipitates and wastes the soap required in the scouring processes. The brewer, on the other hand, seeks for a hard water; and if he cannot obtain it in the neighbourhood of his brewery, he has to 'burtonize' it, or add hardening material. Carbonate of calcium is suitable for brewing all kinds of beers; whilst calcium sulphate, characteristic of the Burton waters, is necessary for the production of pale ales and light bitter beers. Magnesium salts are objectionable in brewing water unless in the form of carbonate, which is in great measure precipitated in the heating of the water before it is run into the mash tun. Alkaline carbonates are very objectionable, as they not only extract and keep in solution the albuminoid matters of the grain, but they also dissolve a harsh flavouring matter from the hops. In the brewing of stout and porter a softer water is desirable—a type of water also preferred by the malster, as hard water extracts more of the organic matter from the grain. Too much salt in water used for malting retards germination of the grain, ten grains per gallon of this ingredient being the maximum allowable. See Frankland's *Micro-Organisms in Water* (1894), Leffmann's *Examination of Water* (1899), Rideal's *Water and its Purification* (1902), and Thresh's *Examination of Waters* (1904).

Water-bath. In this apparatus a substance that is required to be heated to a temperature not exceeding that of boiling water is placed in a suitable vessel, supported by rings, in an outer vessel containing water, and heated over a fire or burner. The common glue-pot is an example.

Water-bed, an appliance designed to distribute the weight of a patient's body over as large a supporting surface as possible.

It consists of a large rubber bag partially filled with warm water. It should be soft and lax enough to allow of its ballooning up on each side of the patient. Some water beds are made in sections, but the filling of these demands special care. The heat from a patient's body is sufficient to keep a water-bed warm.

Water-beetles. See DYTISCUS.

Water-boatman. See BOAT-FLY.

Waterbrash. See PYROSIS.



Water-bugs.

1. *Nepa cinerea* (water-scorpion). 2. *Notonecta glauca* (water-boatman). 3. *Naucoris cimicoides*.

Water-bugs (Hydrocorisæ or Cryptocerata), a division of hemipterous insects, characterized both by their aquatic habitat and by the fact that the antennæ are concealed on the under surface of the head, and so appear to be absent. There are a considerable number of water-bugs, all of which have the front legs rather short, and use them to seize their prey. Examples are the water-scorpion (*Nepa cinerea*)—an insect with a leaflike body and two long processes at the end of the tail, which is found in stagnant water—and the boat-fly.

Waterbury, city, New Haven co., Connecticut, U.S.A., on Naugatuck R., 20 m. N.N.W. of New Haven; manufactures watches. Pop. (1900) 45,859.

Water-caltrop. See TRAPA.

Water-channels may be classed under two heads: (1) those in which the water has its surface open to the atmosphere; (2) those in which the water has no free surface—i.e. is flowing under pressure. The carrying capacity of a channel depends upon (1) the cross-section area of the stream; (2) the wetted perimeter of the channel; (3) the gradient of the stream, or, in pressure pipes, the hydraulic gradient or slope; (4) the smoothness of the channel. The ratio

cross-sectional area
wetted perimeter is called the hydraulic radius or hydraulic mean depth, and is represented by r . In the case of circular channels flowing full or half full H.M.D. = $r = \frac{1}{2}$ diameter. Gradient

slope s is $\frac{h}{l}$, where h = the difference of level of the free surface

between two points at distance l , or, in the case of pressure conduits, is the amount of pressure head which is lost along a length of pipe l . The Chézy formula gives the mean velocity as $v = c \sqrt{rs}$, where c is a coefficient depending on the smoothness of the surface, and varies between 93 and 103 (the units being feet and seconds).

1. **Channels open to the Atmosphere.**—If the ground-level is suitable, a ditch will serve, the natural earth banks being left. But hard clay or gravel is able to stand a velocity of only from three to four feet per second, and light sandy soil only from a half to two feet per second. At the same time, unless the velocity is from two to three feet per second, it is not sufficient to prevent weeds from growing and silt from being deposited. Such a channel with natural banks is the New R., cut in 1609-13 by Hugh Myddelton to supply London with water from the Chadwell springs in Hertfordshire. It has a fall of five inches per mile, and has a carrying capacity of fifty million gallons a day to London.

When rock is cut through, the channel is frequently left rough for economy. But a lined channel will have a greater carrying capacity than an unlined one, owing (1) to the decrease in friction, and (2) to its being possible to secure a greater velocity. Wood lining is used in America for irrigation flumes; brickwork or concrete is generally used in Britain. If the water is for drinking purposes, the channel is frequently covered. This keeps out pollution, and by excluding sunlight prevents weeds from growing. Where the ground-level rises above the gradient line of the channel, either a deep cutting has to be made or a tunnel has to be driven. Where the ground-level sinks below the gradient line of the channel, a bridge (popularly called an aqueduct) is generally built. The bridge can be avoided by carrying the water across the low-lying ground through an inverted siphon under pressure. This is seldom done except in pipes; but still there are cases of masonry aqueducts and tunnels being so subjected to pressure.

Channels flowing open to the atmosphere must be provided at intervals with overflows, sluices, and emptying valves and channels, so that the aqueduct can be emptied and cleaned out in sections. Where an inverted siphon commences and ends chambers are built which contain valves, arranged in some cases to close automatically if the pipe in the valley bursts, and thus prevent

a great loss of water. At the lower end of the siphon there are back-flap valves, which prevent the water from flowing the reverse way. At the upper end they are arranged to close when the flow increases beyond a certain velocity.

2. Conduits under Pressure.—Only occasionally is pressure put on masonry conduits or tunnels, or on pipes of cement or earthenware. They can, however, be constructed to stand a small head, but in almost all such cases metal pipes are used. Recently large mains have been laid in America of wooden staves clamped with iron bands. Wrought-iron tubes and steel pipes formed of riveted plates have of late years been greatly used, on account of their being lighter than cast-iron pipes of the same diameter. A pipe line requires the strongest pipes in the valleys—i.e. where it dips most deeply below the hydraulic gradient; where it approaches the hydraulic gradient at the crests the pressure is least, and the lightest section of pipes is there used.

No part of the pipes ought to rise above the hydraulic gradient. At all summits air-valves are fixed on the top of the pipe to allow the accumulated air to escape. If not so let off, it would be very liable to form an air-lock, and thus stop the flow. At the lowest point on the pipe in every depression a branch pipe is put on, with a valve for emptying and scouring the main. At intervals sluice valves should be fixed so as to divide the line into sections. Fig. 1 shows the section of a pipe line of length l from a storage reservoir A at level h_1 above datum to a service reservoir B at level h_2 ($h_1 - h_2 = h$). The hydraulic gradient is $\frac{h}{l}$. If the section is plotted so that the horizontal distances between points

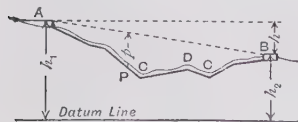


FIG. 1.

on paper are equal to the lengths of pipe between these points on the ground, and if the pipe is of one diameter from A to B, the hydraulic gradient is represented by a straight line from A to B. The pressure (in feet of water head) at any point in the pipe is represented by the vertical distance from that point to the line AB—e.g. the pressure at P = p measured in the scale to which the section is plotted; c, c are

positions for scour valves; D is the position for an air-valve.

Cast-iron pipes are generally made in 9 ft. or 12 ft. lengths, steel pipes in greater lengths. The following kinds of joints are used with cast-iron pipes (Fig. 2):—(a) Flanged, joined by placing a washer of rubber or lead between the flanges, and tightening them together with bolts and nuts. (b) Spigot and socket (or bell, America). The spigot fits into the socket, and is held in its position concentric with the other pipe by means of a coil of rope-yarn packed tightly round it, or a ring of lead wire; and then the rest of the socket is filled with molten lead, which is finally calked tightly in with a heavy hammer and special tools. Lately yarn has been greatly superseded by lead wire, or by having solid-run lead joints in all except small diameter

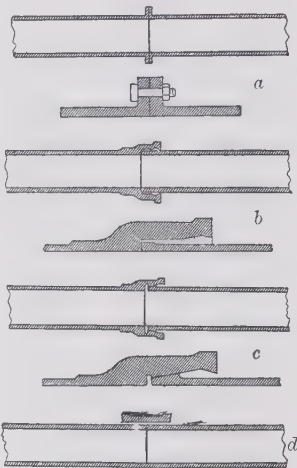


FIG. 2.

pipes, since the yarn must, of course, rot in time. (c) Turned and bored. A bevelled ring on the spigot is turned to fit exactly into a correspondingly bored portion of the socket, and the one pipe is driven tightly into the other, after painting the turned and bored surfaces with sal ammoniac, which causes them to rust together. Sometimes the socket is slightly expanded by heating, so as to receive the spigot more easily, and grip it more tightly on cooling. The rusting of the joint, instead of being produced by sal ammoniac, may be caused by smearing the touching surfaces with a mixture of tallow and resin. (d) Large cast-iron pipes are sometimes made with a spigot at each end and joined by a collar (of cast iron or steel), which is leaded

over the two abutting spigots. In place of lead with which to fill the socket in cast-iron pipes, wooden wedges have been used with success in America. Riveted



FIG. 3.

steel pipes have longitudinal joints as well as circular. The longitudinal joints may be (1) welded; (2) riveted (Fig. 3), either with lap joint or butt joint; (3) lock-bar or 'Coolgardie' joint (Fig. 4). The ends of the plates are 'upset,' inserted in the grooves of the locking bar, which is closed



FIG. 4.

down on them with hydraulic pressure. The circular joints are (1) riveted—only for large pipes; (2) spigot and socket, the socket being riveted on, or the pipe metal being expanded to form it; (3) double spigot and steel collar or Kimberley collar. Wrought-iron and steel tubes are made with screwed spigots to fit into a screwed collar or sleeve, and sometimes with an expanded socket, which is screwed. See Folwell's *Water-supply Engineering* (ed. 1903), and Burton's *Water Supply of Towns* (ed. 1898).

Water-chestnut. JESUIT'S NUT, or WATER-CALTROPS. See TRAPA. The name water-chestnut is also sometimes given to the edible tubers of the Chinese plant *Scirpus tuberosus*.

Water-clock. See CLEPSYDRA.

Water-colour Painting. All paints or pigments must be thinned with some medium, such as oil or water; and when the bulk of the medium is water, we get the class of colours known as water colours. Water-colour painting includes also painting in 'tempera,' undoubtedly the most ancient mode of painting. Tempera is so called because the colour is to a large extent tempered with a glutinous binding medium, soluble in water, such as size, gums, or egg. The binding medium of ordinary water colours is a very small proportion of gum or some such substance. In their preparation there is also added a little glycerin, to keep them in such a moist condition that they may be easily soluble in water. The preparations for tempera are fully described in such works as Field's *Grammar of Colouring* (1875), or F. Hamilton Jackson's *Mural Painting* (1904).

The term 'transparent' applied to colour means that such colour will not altogether hide the col-

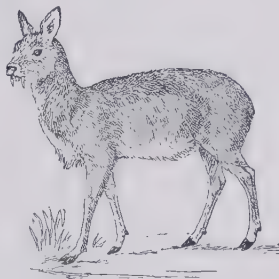
our of the surface to which it is applied. Generally, transparent colours give the appearance of richness and depth. Opaque means that the pigment has body or more substance in it, so that it will cover or hide the surface underneath. The right use of water colours, and very much of the beauty of all water-colour work, depend largely on the right understanding of these two qualities. Generally water-colour drawings are done on white paper. 'The true character of water-colour painting is that the lights should be obtained by leaving the white paper more or less exposed' (Field). It is a common error among young painters in this medium to endeavour to rectify dullness in their work by the addition of more colour, whereas the fault is probably a surplus of pigment. If a drawing has become dull and sodden-looking from excess of pigment, the surplus may be readily washed off by putting the drawing under the tap, and passing a large brush over it. If a small light part is to appear in the midst of a dark mass, instead of leaving out the light part, the whole may be painted at first dark, and when dry the light part may be accurately outlined with pure water. This is allowed to soak into the colour until the water has just disappeared from the surface; then a quick wipe with a clean rag will remove the greater quantity of the colour.

The paper for water-colour painting should not be glazed or very smooth, but should have a certain amount of grain or 'tooth' on it. The number of colours used should be as few as possible. The work should be done as direct as possible. A wash always appears lighter when dry than when wet. Rose madder is a very transparent colour, and yellow ochre has a great deal of body in it. All pigments may have body added to them by the addition of white, Chinese white being probably the best to use; but the addition of white quite changes the colour of the pigments. House painters use water colour mostly for colouring large flat surfaces, such as walls and ceilings; but they add a binding medium, such as a thin solution of size or glue, so that the colour may not be easily rubbed off. The trade name of such a mixture is 'size colour' or distemper. A surface painted with ordinary distemper must not be washed; but there are several patent mixtures on the market which can be washed, such as duresco and Hall's distemper. See Roget's *History of the Old Water-colour Society* (1891), Holme's *English Water Colour* (1902),

Redgrave's *History of Water-colour Painting in England* (1892), MacWhirter's *Landscape-painting in Water Colour* (1900), Wyllie's *Marine Painting in Water Colour* (1901), and Finberg's *The English Water-colour Painters* (1906). See also PAINTING.

Water-cress. See CRESS.

Water-cure. See HYDROTHERAPY.



Water-deer.

Water-deer, a name applied to various even-toed ungulates. The Chinese water-deer (*Hydropotes inermis*) is a small form, which resembles the musk-deer in having no antlers in both sexes, and in that the males have elongated tusks in the upper jaw. In other respects it differs from the musk-deer and resembles the true deer. It is, however, a primitive type of deer, shown by the fact that from two to six fawns are produced at a birth. The name water-deer is sometimes also given to the waterchevrotains, and to the waterbuck of S. Africa (*Cobus ellipsiprymnus*).

Water-dropwort, the popular name given to plants belonging to the genus *Enanthe*, of the order Umbelliferae. They bear few-rayed flowers in compound umbels, followed by globular umbels of egg-shaped fruits, neither flattened nor beaked. *E. fistulosa* is the tubular water-dropwort.

Waterfalls are naturally commonest in a mountainous country. Yet some of the finest, such as Niagara and the Victoria Falls of the Zambesi, are found in relatively flat lands. In the former case the configuration is usually such that long, deep valleys have tributaries whose beds have not been cut down to the level of the mainstream, and enter over waterfalls—at least in glaciated areas. Such waterfalls are common all over the Highlands of Britain and Scandinavia, in the Alps of New Zealand, and other mountainous areas—e.g. Foyers, Scotland (205 ft. in two leaps); the Staubbach in the Alps (870 ft.), Sutherland Falls in New Zealand (1,900 ft.), Yosemite Falls in the Sierra Nevada of

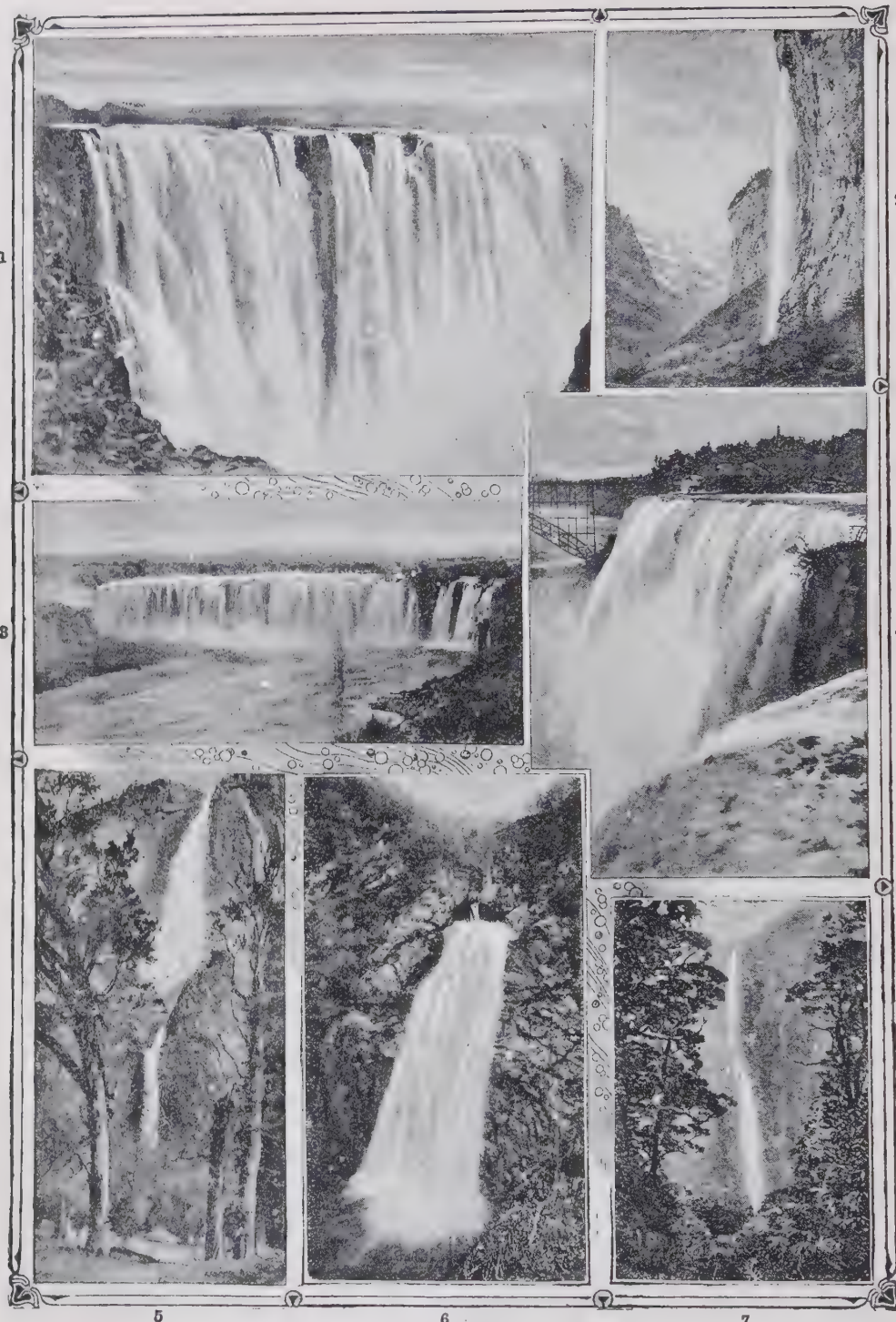
California (2,660 ft.). In flatter areas the waterfall is usually due to the existence of rocks of different powers of resistance to erosion, lying horizontally or dipping up stream. The Niagara Falls (170 ft.) are due to a resistant layer of compact Niagara limestone covering more easily eroded soft shales. Frequently the upper bed is a lava with vertical joints, as in the Victoria (Zambezi) Falls (400 ft.). A volcanic dyke may form a barrier across a stream sufficient to give rise to a waterfall. Another type of waterfall occurs in limestone districts, where the water may disappear underground in a channel dissolved by the stream—e.g. falls of the Rhone at Bellegarde. One of the most remarkable of waterfalls is that of the Kerka in Dalmatia, where the river, by depositing layer after layer of travertine, has so built up its bed that a waterfall has been formed. In a tidal river reversible waterfalls may be found across a barrier, as is the case in the falls of the St. John R. in New Brunswick, where the water falls towards the sea twice a day at low tide, and towards the land twice a day at high tide.



Water-dropwort (*Enanthe fistulosa*.)

1, Flower; 2, calyx and pistil.

Waterfalls are used to supply energy either for directly moving machinery by turning a mill-wheel or a turbine, or indirectly through the electricity generated in dynamos worked by turbines. The Niagara Falls exhibit a most important industrial utilization of water power; but the Sault



Great Waterfalls.

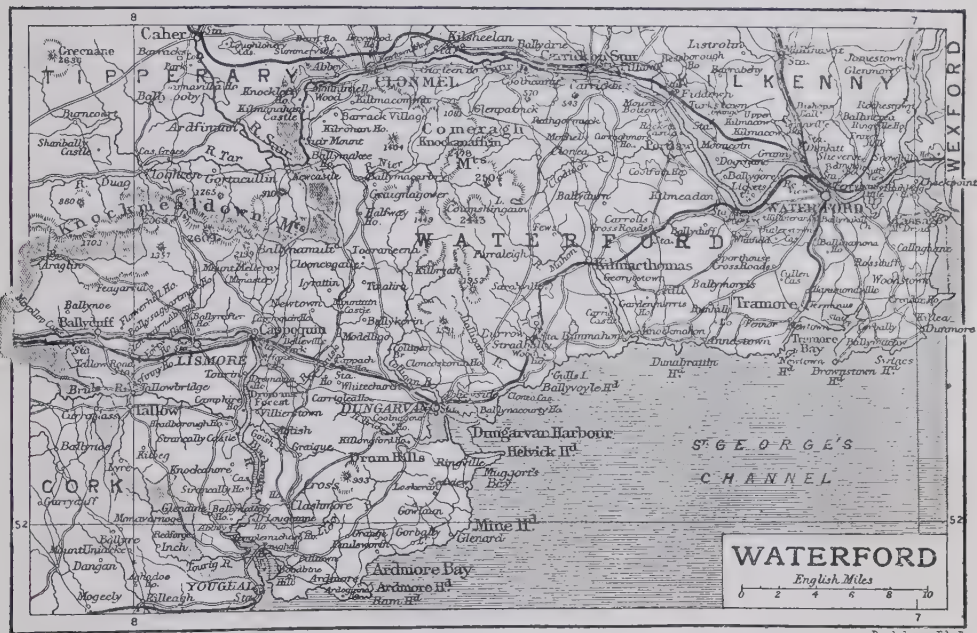
1. Victoria Falls, Zambesi River. (Photo by L. Pedrotti, Bulawayo.) 2. The Staubbach, Lauterbrunnen. 3. Falls of Juanna Catlan, Mexico. 4. Niagara: the American Falls. 5. Yosemite Falls, 2,548 ft. 6. Falls of Foyers, Loch Ness. (Photo by G. W. Wilson.) 7. Sutherland Falls, New Zealand.

Ste. Marie, between Lakes Superior and Huron, the Falls of St. Anthony on the Mississippi, the Falls of Foyers in Scotland, the Rhine falls, and the Rhone falls of Bellegarde, and the innumerable waterfalls of Scandinavia, Switzerland, and similar mountainous lands, are all utilized in this way. It has been proposed to convey power generated at the Victoria Falls of the Zambezi to the Rand gold-field of the Transvaal, and a scheme for this is now (August 1906) being prepared by a German company, to whom the British S. Africa Co. has granted a monopoly.

tracoda common examples are the fresh-water *Cypris* and the marine and fresh-water *Cythere*. The species of *Cypris* are abundant in ponds, while the marine species of *Cythere* occur in rock pools. In both genera there are a bivalved shell, seven pairs of appendages, and a rudimentary abdomen. Of the Cladocera a very common example is *Daphnia pulex*, abundant in fresh water, where it swims by means of its large antennae. It has a bivalved shell and a dorsal brood-chamber. Abundant in fresh water is also the copepod *Cyclops*, in which the female has two con-

Tipperary border, and Drum Hills (990 ft.) in s.w. Principal rivers: Suir, falling into Wexford Harbour; and Blackwater, into Youghal Harbour. The Grand Canal affords through navigation between Waterford and Dublin. More than half the surface is under pasture; dairy-farming is important. Marble is quarried near Cappoquin and Whitechurch. The county returns two members to Parliament. Area (admin. co.), 717 sq. m. Pop. (1901) 87,187.

Waterford, LOUISA, MARCHIONESS OF (1818-91), English artist, was the daughter of Lord



Water-flea, a general name given to minute free-swimming Crustacea, whether fresh water



Water-flea (*Daphnia pulex*).

or marine, especially to the members of the Ostracoda, Cladocera, and Copepoda. Among the Os-

spicuous external egg-sacs. The marine copepods are very numerous.

Waterford, munic., parl., and co. bor. and city, cap. of Co. Waterford, Ireland, on the Suir, 94 m. s.w. of Dublin; has Protestant and Roman Catholic cathedrals. Fragments of the city walls remain, including an 11th-century tower. The harbour is formed chiefly by the estuary of the Suir and Barrow. Butter and bacon are the principal exports. Pop. (1901), munic. bor. 26,769.

Waterford, maritime co., prov. Munster, Ireland. The coast is broken by several inlets—Waterford Harbour, Tramore Bay, Dungarvan Harbour, Ardmore Bay. Mountainous in N. and N.W.; Comeragh Mts. (2,597 ft.), Knockmealdon Mts. (2,199 ft.), on

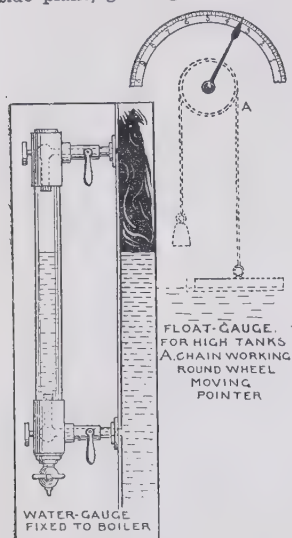
Stuart de Rothesay. She painted a number of exquisite pictures—as *Spring*, *Christmas*, and *The Miracle of Healing the Two Blind Men*; while she illustrated several volumes of the poets. See Augustus Hare's *Two Noble Lives* (1893).

Water-gas. See GAS MANUFACTURE.

Water-gauge, an instrument for indicating the height of water. One of the commonest forms is that attached to the front of boilers, which consists of a glass tube fixed perpendicularly to the boiler, and having a communication at the upper end with the steam space of the boiler, and one at the lower end with the water in the boiler. See BOILER.

Water-glass. See SOLUBLE GLASS.

Water-hemlock (*Enanthe crocata*), a common British water-side plant, growing to a height



Water-gauge.

of two or three feet, with clustered tuberous roots, glossy thrice-pinnate leaves, and wedge-shaped leaflets. It belongs to the



Water-hemlock.

1, Flower; 2, fruit; 3, section.

order Umbelliferae, and bears white flowers in late summer. The whole plant is poisonous.

Water-hen. See RAIL.

Water-hog, a name given to the bush-pigs or river-hogs of Africa, sometimes referred to a separate genus as *Potamochoerus*.

Waterhouse, ALFRED (1830-1905), English architect, born at Liverpool; in 1859 designed the Assize Courts, Manchester, and from that time onwards rose steadily, until, on his retirement in 1902, he held a leading position in British architecture. In the partial rebuilding of Caius College, Cambridge (1868), he modified the Gothic style of his work, which appeared more distinctly in the New University Club (1866). Among his varied undertakings were also Girton College, Cambridge; Eaton Hall; the National Liberal Club; the Natural History Museum, S. Kensington; the Liverpool Infirmary, and other hospitals; and the Hotel Metropole, Brighton. He became an Academician in 1885.

Watering Plants. Water is useless unless given in sufficient quantities to reach the roots. Sprinkling the ground merely cakes the surface, and does harm to the plants. All plants should be watered only when necessary—when they are dry. This is indicated by a tendency to flag or wilt, or by the hollow sound of the pots when tapped. The latter is the safest sign, as, after a prolonged period of dull weather, many plants wilt on exposure to bright sunshine, although still wet at the roots. But a growing plant should not be allowed to become so dry as to wilt, nor should the soil ever reach a condition as dry as powder, except in the case of bulbous and tuberous kinds, during their resting period. Plants under glass should not be sprayed overhead while the sun is shining hot and full upon them. Evening is the best time of the day for watering in summer, and morning in winter. In watering with liquid manure, the material should not come in contact with the foliage. Plants recently potted should not be watered heavily at the roots for a week or ten days; spray them frequently overhead.

Water-lily, a term applied to various water plants, especially to certain species of the genera *Nymphaea* and *Nuphar*. The beautiful white water-lily of British lakes and rivers is *Nymphaea alba*; the common yellow water-lily is *Nuphar lutea*.

Waterloo, vil., Belgium, 11 m. s. of Brussels. On the morning of June 18, 1815, Napoleon had assembled an army of about 74,000 men in front of the ridge of Mont St. Jean and the forest of Soignies. Wellington confronted his adversary with an army of about 67,000 strong, but

composed of various nationalities. The attack began by a demonstration against the British right, but was converted into a real attack. The advanced post of Hougomont was fiercely assailed, but the defence was admirably sustained. Soon after mid-day Napoleon received the intelligence that Bülow, with the 4th corps of the Prussian army, was at St. Lambert, menacing his right flank. A body of French infantry and cavalry was told off to hold Bülow in check, and orders were sent to the French general Grouchy, who was a few miles away, to fall on Bülow and to march to Waterloo. At about half-past one the French began the first grand attack. The 1st corps of D'Erlon advanced against Wellington's centre and left centre. But a magnificent charge of British cavalry drove D'Erlon back down the slope. Meanwhile another grand charge of British cavalry had defeated a body of cuirassiers sent to support D'Erlon, and the French attempt to pierce Wellington's centre at La Haye Sainte was defeated with heavy loss.

It was now about three in the afternoon, and Napoleon had received news that Grouchy would be unable to arrive in time. He resolved to make head against Bülow. Meanwhile he ordered Ney to storm and occupy La Haye Sainte, and to intrench himself firmly within that point of vantage, until, Bülow having been repulsed, the reserve of the Imperial Guard and the masses of the French cavalry could be launched in another mighty effort against the allied position. Under cover of a tremendous cannonade the French captured La Haye Sainte at about six in the evening. This gave them access to Wellington's centre. Ney, thinking that Wellington was about to retreat, resolved to make a cavalry attack against the British right centre. But the French horsemen recoiled before the British and German squares—'rooted,' an eyewitness has said, 'as if they had been in the earth.' Napoleon severely blamed Ney for his action, but allowed him to engage all the French cavalry reserves, fully 10,000 strong. They charged again and again, but failed to pierce the invincible squares. Meanwhile Blücher, who had arrived at St. Lambert, ordered Bülow to attack. The Prussian onslaught began at about half-past four by an attack on Planchenoit on the French right and rear, threatening their only line of retreat. Napoleon was compelled to detach the Young Guard and part of the Old Guard, together



'On the Evening of the Battle of Waterloo.' From the painting by Ernest Crofts, R.A. By permission of the Liverpool Corporation.

about 6,000 strong, to keep back the advancing Prussians, and at about six Bülow's attack was repelled.

As the battle was still undecided, Napoleon resolved to strike a last blow for victory. Wellington had used up nearly all his cavalry, and gradually pushed forward into the fighting line his infantry reserves. At a little after seven the French onset began along the whole line. On the right the troops of D'Erlon gained some partial success; the pressure on Wellington's centre at La Haye Sainte became intense. But on the left the defenders easily held their ground. Then six battalions of the Guard, rather more than 3,000 strong, advanced against Wellington's strengthened right centre. They reached the crest of the ridge in four columns; but these were defeated, one after the other, by the fire of the deployed British

Waterloo. (1.) City, Iowa, U.S.A., co. seat of Blackhawk co., on Red Cedar R., 95 m. N.E. of Des Moines. Pop. (1900) 12,580. (2.) Suburban tn., New South Wales, 2½ m. S. of Sydney; with glass works, breweries, soap works, paper mills, and fell-mongers' yards. Pop. (1901) 9,654.

Waterloo Cup. See COURSING.

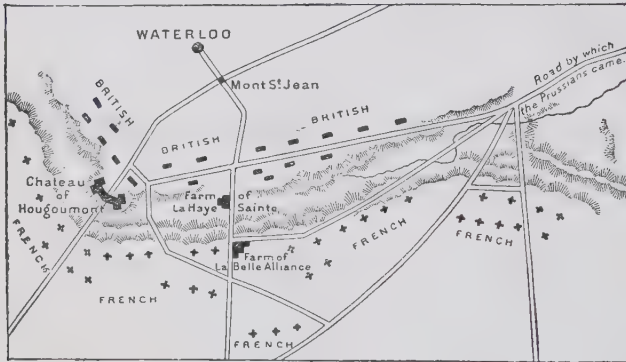
Water-mark. See PAPER.

Water-meadows. Irrigated meadows in Great Britain are principally confined to Hampshire, Wiltshire, Gloucestershire, Dorset, Devonshire, and Berks. Water is taken off at a higher level, allowed to spread by means of open ditches and controlling hatches (sluices), and the tail water conveyed off the land back to the river. The tail water from an upper set of meadows becomes the head water of the next and lower meadows, and in this way the water passes

ally from the linear dimensions, and the result, in cubic feet, is multiplied by 6'2355, or approximately 64, to convert it into gallons. The United States gallon = '83 imperial gallon. American engineers make use of the unit 'feet acres' in describing a reservoir's capacity and in connection with irrigation water, 1 foot acre being 43,560 cubic feet, or 271,618 gallons. Water is measured frequently by its rate of flow, which includes volume and time, as cubic feet per second or gallons per day. The formula for the velocity of water discharging through an orifice, when the water is open to atmospheric pressure and the flow is due to the action of gravity, includes g , in which the units are feet and seconds— $v = c\sqrt{2gh}$; v = velocity in feet per second; g = acceleration due to gravity = 32.2 ft. seconds per second; h = head of water in feet pressing upon the orifice; c = a coefficient depending upon the form, etc., of orifice. For convenience, however, formulæ are generally multiplied by a constant, so as to bring them to cubic feet per minute, gallons per minute, gallons per hour, or gallons per day. It is useful to note that gallons per day of twenty-four hours ÷ 9000 = cubic feet per minute approximately. The carrying capacity of a pipe, the flow of a stream, and the discharge over a weir are frequently given in cubic feet per minute. Quantities to be supplied per head of population, rate of filtration, amount of compensation water, are generally given in gallons per day.

Of Water in Open Channels.—

(1.) Small streams can be measured by forming a clay dam across the channel, and allowing the water to rise till it flows through a pipe or spout, beneath which the pail or measuring box is placed; the flow in cubic feet per minute can be calculated from the time it takes to fill the measure. In this, as in other methods, the average of several tests should always be taken. The measuring cistern found on pipe lines is a small masonry tank, with vertical sides and of known floor area, and through it all the water passes. When it is desired to measure the flow, the discharge is stopped for a few minutes, and the rate at which the cistern fills up is noted. In a more elaborate manner this method is frequently used in measuring the flow into service reservoirs. The pipe conveying the water to be measured discharges into a measuring box with a rapidly closing valve at the bottom. When the valve is open the water drops directly



Plan of the Field of Waterloo.

infantry, who, rising from their concealed position, drove the stricken masses into the valley below. At the same moment the British commander pushed his whole army forward. Soon after eight o'clock part of the Prussian 1st corps made its appearance on the field, and Napoleon's right was instantly driven in, and the French army began to dissolve in rout. A short time afterwards Bülow renewed the attack on Napoleon's right flank and rear; Planchenoit was stormed after a desperate struggle, and 40,000 more enemies bore down on the French host. The defeated army fled in disorder from the field, save the four battalions of the Guard, who, formed into squares, fought stubbornly to the last, and perished almost to a man. The French were literally hunted down by the Prussian horsemen. The French army was virtually annihilated; the losses of Wellington and Blücher were about 20,000 men.

down the valley. At the same time water is taken off and returned to the river at any convenient spot. The privilege of using the water is common, and is regulated by usage. The water is applied in alternate weeks from November to March. The meadows are then kept dry for the early spring feed, which is eaten by ewes and lambs. After the spring feed has been eaten, water is again applied every alternate week until the meadows are laid dry for hay-making, about the latter end of June. When the hay has been secured, the meadow is again watered in order to produce an autumn feed, which is useful for horses and cattle. The meadows are cleared of stock in November. The letting value of a good meadow for the entire season is often £8 per acre.

Water Measurements. The English practical unit of quantity for water is the gallon. The volume of a cistern, tank, or reservoir is calculated geometric-

through it, leaving the box empty. To measure the flow the valve is shut, and the exact time of shutting is noted. As soon as the box is full and commences to overflow, the time is again noted. The flow of the pipe per minute = $\frac{\text{capacity of box}}{\text{time in minutes}}$.

(2.) Where the stream has to be gauged frequently, it is usual to put up a gauge board in a dam, formed either of clay, or of masonry, or concrete. The depth of water flowing over the sill is measured, and the flow is calculated from this by a formula which takes into account the form of the weir. The gauge board has a flat face on the upstream side, and the edges of the notch on the down-stream side are chamfered off, so as to give a sharp edge for the water to flow over. The velocity of approach in the stream is reduced as much as possible—i.e. the gauge board is made to block up a considerable pool.

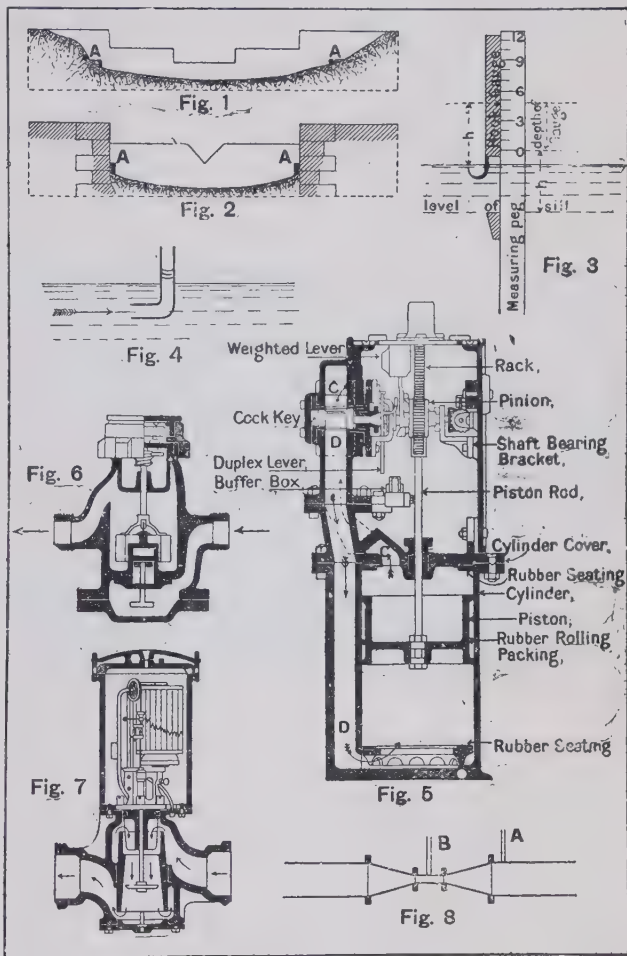
The square notch is the commonest form of gauge notch, and is the only one used for large streams. If the crest is not the full width of the stream channel it has 'end contractions,' and in that case the board should extend beyond the end of the crest not less than three times the depth of water over the weir, and the following formula should be used:— $Q = 3.33(l - 0.2h)h^{\frac{3}{2}}$, where Q = the flow in cubic feet per second, l = length of crest in feet, h = depth of water in feet. If the crest is the full width of the stream channel, the end contractions are 'suppressed,' in which case the formula becomes:— $Q = 3.33l \cdot h^{\frac{3}{2}}$. Where the flow varies greatly, a shorter V-shaped notch is sometimes cut in the centre of the larger one. Professor Jas. Thomson's V notch is specially suitable for varying flows, and if one V will not carry all the water, a series all set at the same level is used. The formula for a right-angled V is $Q = 2.54 h^{\frac{3}{2}}$, the units being the same as before.

Orifices are not capable of measuring through a great range, as the only variable quantity is the 'head,' or in the case of submerged orifices the difference of 'head' above and below the orifice. Their form is either circular or rectangular, and with care the error can be kept within one per cent. They are much used where a definite constant supply has to be delivered—e.g. in regulating compensation water. The head is measured from the centre of the orifice to the water surface above, and the formula for the flow from a circular orifice is:— $Q = 3.9d^2 \sqrt{h}$, d being diameter of orifice in feet, and Q and h

being as before. Great care must be taken in measuring the depth of water in gauging. The depth required is that from sill level to the surface of 'still water' so called. Close to the weir the surface has a noticeable curvature, and measurements taken there would be inaccurate. In small streams, a simple

tion, the most accurate readings are taken with a hook gauge, as shown in Fig. 3. It can be clearly seen when the point of the hook is just cutting the water surface.

In measuring streams from the cross-sectional area and the velocity, a position must be chosen where the channel is regular and



Water-meters.

(For explanation, see text.)

method is to have a block on the gauge-board at each side, as at A, A (Figs. 1 and 2), level with the sill, or at a known height above it. In larger streams, a peg (or preferably two pegs, one at each side of the stream) should be carefully fixed, having a block level with the sill, or at a known height above it. As water rises up a foot-rule by capillary attrac-

tion, the flow uniform. Several sections of the stream should be taken from which to form an average. The surface velocity at the centre of the stream can be found by timing floats, which should be of specific gravity only slightly less than water; otherwise they will float high and be affected by the wind. Burton says, 'The mean velocity may be

taken as three-fourths the surface velocity.' A float with a sinker hanging below is sometimes used to get a mean between the surface and bottom velocities. Current meters are made in the form of screw propellers, having a train of wheels connected to a finger which moves round a dial, on which the number of revolutions is registered, and from this the velocity of the water is deduced. Pitot's tubes are of the form shown in Fig. 4, and from the height to which the water in the tubes rises above the stream-level the velocity can be calculated. As well as being used to find the velocity in open streams, these tubes have been employed to calculate the flow from fire hydrants under pressure. It was proved that, with the Pitot tube midway between the centre and side of the pipe

of water causes a turbine wheel to rotate, and from the number of revolutions recorded the quantity of water which has passed is deduced. With a constant and sufficiently large flow such meters are wonderfully reliable; but when the flow is below a certain limit the water passes through the turbine without causing any rotation, and as that limit is approached the meter records are low. Nevertheless, these meters are very commonly used by water companies and corporations for measuring water sold for trade purposes.

Examples of *valve meters* (Fig. 7) are Deacon's and Ginman's. A valve is so balanced by a counterpoise weight that it only opens sufficiently far to allow the water to pass. An indicator shows to what extent the valve is open at any instant, and this is recorded

the pressure at the restricted part is much less than at the full diameter at either side. From the difference of pressures the velocity, and consequently the flow, can be calculated. These meters are used on large mains, and the loss of head caused by them is inappreciable. See TUDSBURY and BRIGHTMORE'S *Principles of Waterworks Engineering* (3rd ed. 1905); N. BEARDMORE'S *Manual of Hydrology* (1862); HENNEL'S *Hydraulic and Other Tables* (2nd ed. 1901); NEVILLE'S *Hydraulic Tables* (ed. 1875); and *Proc. Inst. C.E.*, vol. lxxx. p. 318, and vol. cxxvi. p. 24. See also WATER SUPPLY.

Water-melon, the fruit of *Citrullus vulgaris*, a tropical plant belonging to the order Cucurbitaceae. In Britain it can only be grown in a warm greenhouse. It likes plenty of moisture, both at the root and in the atmosphere. The fruits reach nine or ten inches in diameter.

Water on the Brain. See HYDROCEPHALUS.

Water-ousel. See DIPPER.

Water Poet. See TAYLOR, JOHN.

Water-polo, as an organized sport, is controlled by the Amateur Swimming Association. A good swimming bath provides the best field of play, the water not being shallower than three feet. The distance between the goals may vary from 19 to 30 yds. The maximum width of the course is 20 yds. Goals must be 10 ft. wide, the cross-bar to be 3 ft. above the surface when the water is five feet or over in depth, and 8 ft. from the bottom when the water is less than five feet in depth. The ball may measure from 26½ to 28½ in. in circumference. A team consists of 7 players, and the duration of a match is 14 minutes—7 minutes each way exclusive of interruptions. There are at least eleven ways, not to speak of corollaries, in which it is possible for a player to commit a foul, so that the referee's duties are heavy. English clubs now number more than 600. In 1886 their number was 50.

Water-power. See HYDROKINETICS, and HYDRAULIC MACHINERY.

Waterproofing. See INDIA-RUBBER.

Water-rail. See RAIL.

Water-rat. See VOLE.

Waters, NATURAL. See WATER.

Water-scorpion. See WATER-BUGS.

Watershed, or **WATER-PARTING**, the dividing ridge from which streams flow in opposite directions. It bounds the drainage area of a river.



Water-polo—a Shot for Goal.

and attached to a Bourdon gauge, the discharge could be relied on to within 5 per cent. for a rate of flow varying between 20 and 400 gallons a minute (*Proc. Inst. C.E.*, vol. cxliii. p. 281).

Of Water in closed Pipes under Pressure.—In *positive meters* the volume of the water is directly measured by causing it to flow alternately into two vessels of known capacity. When the first vessel is full, the supply is turned into the other, whilst the discharge pipe draws from that previously filled. The number of times that each vessel is filled is recorded by a mechanical device, and on a dial the quantity of water (in gallons) is denoted. In Kennedy's meter (Fig. 5) the vessel is a cylinder; in Kent's it is of irregular shape. Positive meters are the only thoroughly reliable ones in all circumstances. In *turbine meters* (Fig. 6) the flow

on a diagram, which is drawn by clockwork past a pencil on the indicator. From this diagram, the quantity which has passed through in any period is deduced. Such meters indicate clearly any alteration in the flow, and are used rather to show the variation in flow at different times than the actual quantity of water which has passed through the meter. They are suitable for registering large flows, and do so with little loss of head. They are chiefly used as waste-water indicators. The principle of the Venturi meter depends on the fact that where the velocity increases the pressure decreases. A pipe of large diameter is gradually diminished to a small diameter and gradually enlarged again (Fig. 8). The velocity through the portion of small diameter is much greater than that through the rest of the pipe, and consequently

Water-softening. Natural waters containing calcium and magnesium bicarbonates and calcium sulphate are 'hard'—i.e. do not readily lather with soap, and form a deposit or scale in kettles, boilers, etc. This is objectionable, both as wasting soap in textile industries and in impairing the efficiency of or even destroying boilers; so hard waters should be softened or the calcium or magnesium salts removed before use. The bicarbonates are removed by the addition of the calculated quantity of slaked lime stirred up with water into a 'milk,' all the calcium being precipitated as carbonate, $\text{Ca}(\text{HCO}_3)_2 + \text{Ca}(\text{OH})_2 = 2\text{CaCO}_3 + 2\text{H}_2\text{O}$. If calcium sulphate is present, the calcium is also precipitated as carbonate by the addition of soda ash, $\text{Na}_2\text{CO}_3 + \text{CaSO}_4 = \text{Na}_2\text{SO}_4 + \text{CaCO}_3$, the sodium sulphate formed being soluble and comparatively unobjectionable. In Dr. Clark's system the precipitation is done in large tanks, from which, after a suitable interval, the clear softened water is drawn off for use. In Porter's process a system of filter presses is used for the removal of the precipitate. In Atkin's scheme, adopted at the Southampton water-works, a combination of the above methods is employed. Milk of lime is fed continuously into the mixing tank. From this the water flows slowly through a large brick-lined softening tank, and on, over a cross-wall at its lower end, to a series of filters. Each of these consists of a number of perforated revolving discs, covered with filter-cloths, which effectually arrest that part of the precipitate which has not subsided in the softening tank. In the Maignen and Stanhope systems the water, after being mixed automatically with the requisite chemicals, flows through iron tanks fitted with baffle-plates and shelves, upon which the precipitated salts are deposited, and which can be readily cleansed. The settling tank in the Kennicott water-softener, lately installed on the Union Pacific Ry., is a steel cylinder, 43 ft. high and 13 ft. diameter, with a conical bottom. The chemically treated water is forced down to the bottom of the tank within an inner conical partition (the diameter of which increases downwards), and rises up between the inner and outer shells to the soft water overflow, depositing the solid precipitate on them as the rate of flow diminishes with the increased cross section. Water of 21° of hardness is thus altered to that of 4°; 57 lbs. of soda ash and 1½ barrels of lime are used to soften 150,000 gallons of water in twenty-four hours. Another

recent system, particularly well adapted for small installations, is the Bruun-Löwenher softener. This differs from others chiefly in that the flow through the softening tank is intermittent. The hard water is led into an oscillating receiver, which tips its contents automatically into an intermediate chamber, together with a measured quantity of milk of lime or other chemicals. Each oscillation similarly opens valves, admitting the water into the settling tank, from which it is finally passed through a filter of wood wool into the storage tank of clear softened water.

Water-soldier (*Stratiotes aloides*). See STRATIOTES.

Water Spaniel. See SPANIELS.

Waterspout. When a whirlwind occurs over the sea or on expanses of fresh water, such as lakes or rivers, a waterspout results. Its characteristic feature is a tapering cloud, shaped like a funnel. It appears first at the under surface of the overhanging clouds, assuming the form of a small pendant, and apparently descends to sea-level, where the greatly agitated waters ascend to meet it. Waterspouts are most frequently met with in warm equatorial seas, where the winds are light or calm. They have, however, been observed in higher temperate latitudes, a considerable number having been recorded in the Gulf Stream in winter, during the prevalence of cold westerly winds blowing off the still colder adjacent land surfaces. The occurrence of the spout depends to a large extent on purely local causes, resulting in unstable atmospheric conditions, but in a great many cases the proximate cause is the importation of air with a temperature much lower than that of the water surface which it traverses. It is concluded that opposite motions coexist in the interior and exterior portions of a waterspout, and it is believed that the descending central currents are streams of rain, precipitated into the virtually empty core within the whirling spout. See H. C. Russell's 'Water Spouts on the Coast of New South Wales,' in *Trans. Roy. Soc., N.S.W.*, vol. xxxii. (1898).

Water Supply. Deep wells are not entirely of recent date. Joseph's Well, at Cairo, is 297 ft. deep, and the Chinese wells were sunk by almost present-day methods to a depth of 1,500 ft. Aqueducts were built not only in ancient Greece and Italy but throughout the Roman empire—in France, Spain, and Germany—and some of these are still in use. The water was conveyed by tunnel through hills, and generally crossed valleys on long series of arches, though the

principle of the inverted siphon was clearly understood. Lyons in France was supplied by a lead pipe siphon from 12 to 18 in. in diameter and 9 m. long, which worked under a 200-ft. head; but bridge aqueducts were generally constructed. With the introduction of cast-iron pipes in the beginning of the 19th century a great advance was made. Previously the mains had been bored-out trunks of trees—generally elm—and the diameter of the water way seldom exceeded seven inches. This necessitated several lines of pipe, laid side by side, to do the work which is now done by a single main of larger diameter. More recently, riveted and welded pipes of rolled steel have to a certain extent displaced cast-iron pipes, more especially those of large diameter or those for exportation.

Typical Systems.—The following diagrammatic sections (Figs. 1, 2, 3) show different systems of supplying a town with water. Fig. 1 shows a *gravitation system* with two sources. The valley carrying the rainfall off a gathering ground, G, is dammed across to form a storage reservoir, R. From this the conduit *a b c d e f g*, with the town supply, starts, and here what is termed the 'compensation water' for the stream naturally fed from G is measured out and discharged. The town supply, if large in quantity, will probably be carried partly by conduit in open cut, or covered, *a b, e f*, or in tunnel, *c d*, at a gradient, and partly by pipes, *b c, d e, f g*, under pressure where valleys are crossed and the ground falls below the hydraulic gradient. This conduit terminates at a high level service reservoir, H.L.R. The water next passes to the filter beds F.B., and from them to the clear water tank C.W.T. From a screening chamber in the clear water tank the mains *h k* lead to town for distribution. A supply is also shown coming from springs, S S S, which are collected into a cistern, C, and brought by conduit direct to the clear water tank, since no filtration is necessary. A break pressure tank, B.P.T., with a capacity of only a few minutes supply, is shown, which regulates the water for a low-lying district of the town.

Fig. 2 shows a *deep well supply*. Pumps, P, lift the water from the well W, and force it to a clear water tank at an elevation sufficient to supply the district by gravitation. This water, being from a deep well, will not require filtration.

Fig. 3 shows a *pumped river supply*. From a river, R, the supply is drawn through a tunnel, T, and raised by pumps, P, to the surface. Here it may pass through settling tanks, S.T., and filter

beds, F.B., if necessary, before being forced to the clear water tank which supplies the town. A stand pipe, SP, is sometimes used, to the top of which the water is lifted, and from there it flows by gravitation to the clear water tank. The stand pipe has the advantage of giving the pumps a constant head to work against, but in many cases it is dispensed with, the water being pumped directly into the distribution mains; and this practice is becoming more common.

Sources of Supply.—These may be either (1) surface water, or (2) ground water. A surface supply can be obtained by drawing from a stream, or spring, or lake. If the quantity of water required daily is small in proportion to the flow of the stream or spring at all times, all that is necessary is to divert from its ordinary course into a channel or pipe such quantity as is to be utilized. If, however, account has to be taken of regular seasons of small flow in the stream, and possible droughts, provision has to be made by storing the surplus water carried down in time of flood. A ground water supply is such as is obtained from deep wells.

Artesian wells get their name from Artois, the French province, where they have long been used. The name is applied to wells which have been sunk through some impervious stratum into a stratum bearing water under pressure, with the result that the water rises up the well and flows out at the surface (see Fig. 4). At Passy, near Paris, a well, 1,923 ft. deep, delivers $\frac{5}{8}$ million gallons a day 54 ft. above ground. In S. Dakota a well, 725 ft. deep, delivers $1\frac{1}{8}$ million gallons a day. London obtains a large quantity of its supply from wells sunk into the chalk below the London clay. Headings or galleries are driven in the chalk from the bottom of the well so as to tap a large district, and all the water percolating through fissures in the chalk walls or roof of the heading flows along the heading to a sump at the bottom of the main well, and from there the pumps raise it to the surface (Fig. 5).

An ordinary town supply usually includes water for—(1) domestic and municipal supply, which means all used for drinking, washing, sanitary purposes, street watering, and fire extinguishing; partly (2) trade, since many manufacturers have private wells, and are not dependent on the public supply; only to a small extent (3) power; and seldom includes (4) irrigation. The quantity of a town supply is frequently reckoned as so much per head of population per day. In Great Britain the average may be taken

as 33 gallons per head per day, varying between 20 and 50. In villages 15 is a fair supply. In the United States the amount varies from 30 to over 200. In estimating the necessary quantity to be provided, due allowance must be made for increase of population and a probable increased consumption per head, which generally follows on the introduction of a new supply.

Rainfall.—Unless records for a large number of years are available, little can be done in the way of making an accurate estimate of the available rainfall, since different years vary greatly. An engineer wishes to know: (1) average annual rainfall; (2) rainfall of three consecutive dry years; (3) maximum length of drought, or very small rainfall; (4) maximum rainfall in a short time—say six hours or twenty-four hours. Statistics show that the minimum annual rainfall is about two-thirds of the average annual rainfall, whilst the average for three consecutive dry years is about four-fifths of the average annual rainfall. The maximum only comes into account when arranging the size of the waste weir, or by-wash channel; and it is not the annual maximum, but the maximum in a short period, which has to be provided for.

On a catchment area with considerable differences of level, it is generally found that the rainfall on the higher parts exceeds that on the lower. Consequently, in order to get useful records, rain-gauges have to be properly placed at different known elevations. In the Sierra Nevada this increase has been estimated as 6 inch per annum for each 100 feet rise.

Evaporation is generally expressed as equivalent to a loss of so many inches of annual rainfall. It varies much less from year to year than rainfall does, but it varies greatly in different districts, and at different seasons in the same district. In Great Britain waterworks engineers are in the habit of allowing about 14 or 15 inches for annual evaporation and percolation.

The geology of the district has to be studied when defining the boundaries of a catchment area. It may happen that some pervious stratum overlying an impervious one will allow the water falling upon one drainage area to pass under hills and appear as springs in another, thus making the collecting ground considerably different from what it would be if judged by the conformation of the ground surface alone. If the surface be steep and of a hard, impervious nature, the rainfall will be quickly carried down

to the valley, and the streams will be liable to floods and droughts. If, on the other hand, the ground has no great differences of level, and if the soil is loamy or sandy, and especially if it is well covered with vegetation, much of the rainfall will be retained in the ground, and the flow of the streams will be maintained more regularly throughout the seasons.

The number of days' supply which a reservoir should be capable of storing depends on the droughts of the district, and in Great Britain may be put down as from 150 to 180, and the collectable rainfall may be taken as 40 per cent. of the mean. The most accurate method of getting at the available water of a catchment area is from the gaugings of the streams. If stream gaugings of accuracy over a long series of years can be got, then no account need be taken of evaporation, absorption, and percolation, as they are already dealt with. The evaporation from the water surface of the reservoir should, however, be taken into account.

When the available water has been so estimated, a certain amount has generally to be guaranteed for compensation to the stream before any is extracted for supply. Compensation water is claimed by various bodies—*e.g.* riparian owners, farmers, mill-owners, manufacturers, and fishing associations—and as the quality of the water is seldom of first importance to these claimants, a separate compensation water reservoir is sometimes arranged to store flood water, or such as would not be suitable for town supply. According to present parliamentary practice, the amount of compensation water to be provided is one-third of the average flow of the stream, and in certain cases particular clauses are inserted regarding an extra quantity for flushing purposes.

Intakes.—Where several springs, rising near one another, form the source of supply, it is common to build small masonry chambers round each, and lead pipes from these to a collecting well, from which the main pipe takes its start. Water can be collected from a river by building a low dam or weir across the channel, and drawing from the pool so formed. If the river has a gravelly bank and bed, a gallery with porous floor and walls is built close to the channel, and into this the water percolates. A conduit from the gallery leads to the pumps, by means of which the water is raised to the surface (Fig. 6). In lakes the intake is similar to a reservoir valve tower. Chicago is supplied from Lake Michigan through an intake 4 miles from

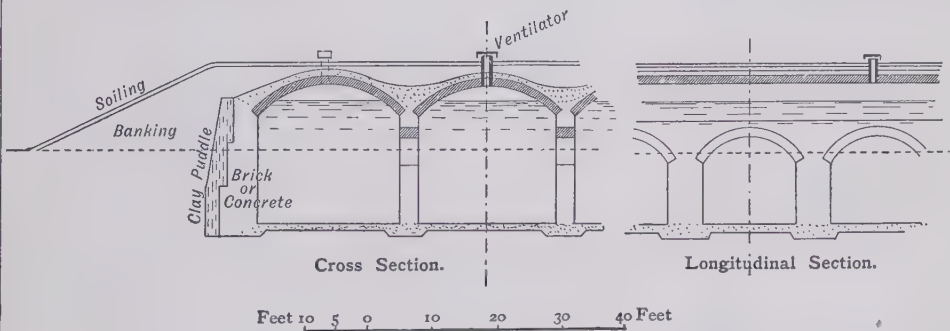
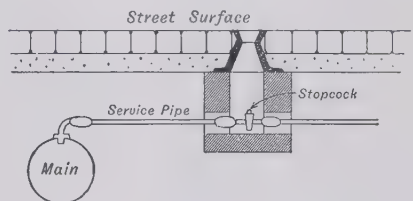
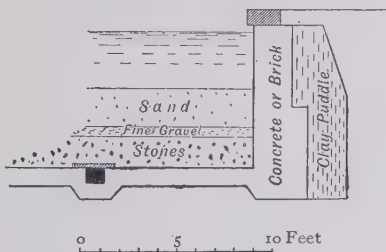
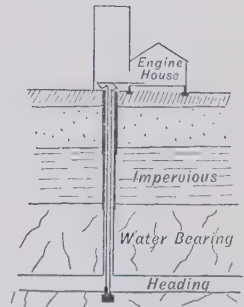
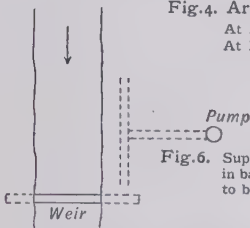
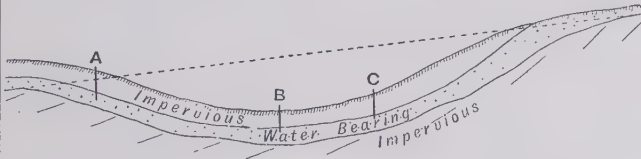
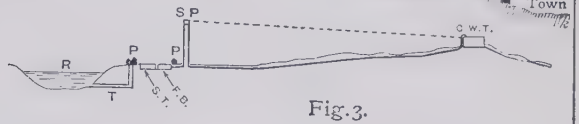
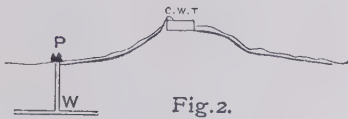
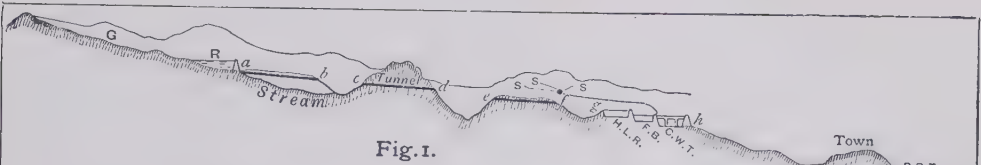


Fig.8. Covered Reservoir or Clear Water Tank.

Water Supply.
(Diagrams referred to in text.)

the shore, at a point where the water is 40 ft. deep.

Conduits.—From the source of supply to the point of distribution the water may flow either in pipes under pressure, or in aqueducts with a free surface. Where the volume of water is large, aqueducts are used as far as possible, and pipes only where it is necessary to dip down below the hydraulic gradient. If the volume is not great, pipes are used throughout, and the line can generally be made shorter than if it is necessary to arrange for a constantly falling gradient, as in the case of a channel where the water is not under pressure.

Purification.—Spring and well waters seldom need any purification. In sinking through the earth they have passed through natural filters, which have freed them of deleterious bacteria, though certain minerals may have been picked up. The hardness may be excessive, but as drinking water they are generally safe. Surface waters, on the other hand, frequently contain impurities in solution as well as impurities in suspension, and to remove these there are various methods of treatment.

Sedimentation.—Inorganic matter, such as particles of sand or clay, is carried along by the current in a stream, and as the rate of flow decreases they sink to the bottom, the smaller particles remaining in suspension longer than the larger ones. Not only is inorganic matter thus removed, but the number of the bacteria is also greatly reduced, probably owing to their being entangled with the falling particles, and so carried down.

Filtration.—Sand filters have regularly been used in Britain since 1829. Their form and action are as follows:—A watertight tank is constructed of concrete or brickwork, from 6 to 8 ft. deep, and of area depending on the amount of water to be filtered (see Fig. 7). Over the floor drain-pipes or channels lead to the outlet pipe, and over these drains is a depth of from 2 to 3 ft. of broken stones and gravel, decreasing in size upwards. Upon this gravel rests the bed of filtering sand, which is about 2 ft. thick. The water is slowly supplied to the filter, and is allowed to rise about 3 ft. above the surface of the sand. On sinking through the sand and gravel to the drainage channels, it escapes by the outlet pipe to a clear water tank. A vertical rate of from 4 to 6 in. per hour is an average rate of flow, equivalent to from 2½ to 4 million gallons of water filtered per day per acre of sand. After some days (ten to twenty) the filter is found to

work more slowly, as the upper layer of sand is getting clogged. The water is then run off, and about half an inch of the sand is skimmed off. A filter improves, with age, and when the sand requires scraping it is not because the effluent is impure, but because the flow of water is so small that the working is uneconomical. The dirt which clogs the upper layers of sand is found to be a jelly-like deposit of organic matter as well as inorganic, and a bacteriological examination of the lower sand shows the same organisms, but in reduced numbers. It is this organic slime which is the effective agent in filtering, the sand merely acting as a mechanical support. During the cholera epidemic at Hamburg and Altona in 1892, Hamburg, with unfiltered water drawn from the Elbe above the town, had a death-rate of 134 per 10,000 in two months, whilst Altona, with sand-filtered water drawn from the Elbe below both the towns, had a death-rate of 21·3 per 10,000.

What are known as mechanical filters have recently been largely used in America, and with them water is forced through the bed of sand or crushed quartz at the rate of from 100 to 125 million gallons per day per acre of sand. In most cases a coagulant—aluminium sulphate—is used, which assists the filter, but the effluent is not so free from bacteria as that from slow sand filters.

Lately, roughing filters have been used on the Continent, in which the water passes through a bed of gravel about 12 in. deep before coming to the ordinary sand filters, with the result that a greater quantity of water can be put through the sand filters.

Clear Water Tanks.—From the filters the water passes to a clear water tank, which feeds the distribution mains (see Fig. 8). The clear water tank or service reservoir is generally from 10 to 20 ft. deep, and built with brick or concrete walls, concrete floor, and frequently an arched roof supported on piers. Many engineers back the walls with clay puddle, and some put a layer under the concrete floor. As well as inlet and outlet pipes, there must be a scour pipe and an overflow, and the roof must be properly ventilated to allow the air to enter or escape freely as the water-level falls or rises. Over the roof earth is banked, with the result that the water is little affected by the outside temperature. Round the mouth of the outlet pipe are screens of fine meshed copper wire gauze. The clear water tank acts as a regulator between the filters, which supply at a constant rate,

and the mains, in which the draught at some hours is much greater than at others.

Distribution.—The outlet pipes from the clear water tank lead to the arterial mains, which stretch over the area of distribution and feed the service mains of 6-in. diameter and less. These last are frequently connected so as to draw a supply from either direction, since 'dead ends' in the pipes are to be avoided. The service pipes leading into the houses are generally of lead, and are attached to the service mains with a brass ferrule screwed into the cast-iron pipe (see Fig. 9). Street piping includes stop valves, pressure-reducing valves, fire hydrants, street-watering hydrants, scouring valves, air valves, waste water meters, and trade supply meters.

Where the levels throughout the area of supply vary greatly, it is advisable to take some measures to keep up the pressure in the high districts, and at the same time to reduce the pressure in the low-lying districts, and thus prevent waste. This may be done with a pressure-reducing tank, which is a cistern placed at the level necessary to give sufficient pressure to the houses supplied. It is fed through a ball valve, so that when the draught is small and the cistern fills up, the valve closes with the rising float, and the supply is stopped. Pressure-reducing valves effect the same purpose. See Burton's *Water Supply* (2nd ed. 1906).

Watertight Compartments. See SHIPBUILDING.

Waterton, CHARLES (1782-1865), English naturalist and explorer, was born near Wakefield. After spending twelve years (1812-23) in South America, he published *Wanderings in South America* (1825), which proved immensely popular. He also published *Natural History Essays* (three series, 1838-57), the second edition of which (1879) contains a memoir of their author.

Watertown. (1.) City, New York, U.S.A., co. seat of Jefferson co., on Black R., 65 m. N. of Syracuse, with iron, carriage, paper, and flour industries. Pop. (1900) 21,696. (2.) City, Jefferson co., Wisconsin, U.S.A., on Rock R., 30 m. W.N.W. of Milwaukee. Here is North-western University (1865). Pop. (1900) 8,437.

Water-Tube Boiler. See BOILER.

Waterville, tn., Kennebec co., Maine, U.S.A., on the Kennebec, at Ticonic Falls, 18 m. by rail N.N.E. of Augusta; is the seat of Colby Baptist College. There are railway workshops, and cotton and woollen factories. Pop. (1900) 9,477.

Water Violet (*Hottonia palustris*), a common British pond plant belonging to the order Primulaceæ. It bears much-divided, subaqueous leaves, and whorls of pink and yellow salver-shaped flowers on a leafless stalk, which rises above the surface of the water.



Water Violet.

1, Corolla, separated; 2, calyx, separated; 3, ripened seed vessel; 4, section of seed vessel.

Watervliet, city, Albany co., New York, U.S.A., on w. bk. of Hudson, 5 m. above Albany, and directly across the river from Troy. Here is a United States arsenal. Pop. (1900) 14,321.

Water Wheels. See HYDRAULIC MACHINERY.

Watford, tn., Herts, England, 18 m. N.N.W. of London, with an ancient church. Industries include breweries, malt works, and corn mills. Pop. (1901) 29,023.

Watkin, SIR EDWARD WILLIAM (1819-1901), English railway manager. As chairman of the Manchester and Sheffield, of the South-Eastern, and of the Metropolitan Rys. (having been appointed to the last named in 1872), he strove to organize a continuous service from the south coast (Dover) to the north of England. Similar aims of unification led him to promote schemes for a tunnel between Dover and Calais, and between Scotland and Ireland. He supported the Liberal interest in Parliament, representing Stockport from 1864-8, and Hythe from 1874-95. He received a baronetcy in 1880. He had a scheme for building, at Wembley Park, near Harrow, a rival to the Eiffel Tower, but it was never completed.

Watlings Island, one of the Central Bahama Is., supposed to be the San Salvador (Guanahani) of the first landing of Columbus.

Watling Street, old Roman road, which, commencing at Dover, extended to London *viâ* Canterbury, and thence northwards in two diverging sections, one touching Carlisle and the other York. Fragments of the great highway are still to be traced, and the street in London bearing the above name is veritably a relic of the Roman occupation of Britain.

Watson, HEWETT COTTRELL (1804-81), English botanist, was born in Yorkshire. In 1844 he assisted in preparing the *London Catalogue of British Plants*; and the first volume of his *Cybele Britannica*, his *magnum opus*, appeared in 1847, the term 'cybele' being intended to signify 'habitat.' In 1873-4 appeared his *Topographical Botany*.

Watson, JOHN (1850), better known by his *nom de plume* of 'Ian Maclaren,' English author, born at Manningtree, Essex; was Free Church minister successively of Logiealmond; Free St. Matthew's, Glasgow; and Sefton Park Presbyterian church, Liverpool (retired 1905). He was Lyman Beecher lecturer at Yale (1896). His liberality of view at one time involved him in controversy. His best-known works are *Beside the Bonnie Brier Bush* (1894); dramatized 1905), *The Days of Auld Lang Syne* (1895), *Kate Carnegie* and *The Mind of the Master* (1896), *The Potter's Wheel* (1897), *The Life of the Master* (1901), *The Homely Virtues* (1903), and *The Inspiration of our Faith* (1905).

Watson, RICHARD (1737-1816), English bishop and controversialist, was born in Westmorland, and became professor of chemistry (1764) and of divinity (1771) at Cambridge. In 1782 he was appointed bishop of Llandaff. On his estate in Westmorland he encouraged new ideas in agriculture. In public life he was noted for his support of the proposal to make the Prince of Wales regent in 1788. His writings include *Apology for Christianity* (1776), in which he endeavoured to break a lance with Gibbon; and (1796) *Apology for the Bible*, a tilt at Tom Paine. See his *Anecdotes of the Life of Richard Watson* (1817).

Watson, ROBERT (1746-1838), Scottish adventurer, was born in Elgin, and claims to have been intimate with Washington, and to have risen to the rank of colonel in the American army. After his return to England he became secretary to Lord George Gordon; he was subsequently wanted on a charge of high treason, owing to his

avowed sympathy with the French revolution. In 1798 he escaped to France, where he became Napoleon's tutor in English, and principal of the revived Scots College. In 1817 he claimed to have purchased *The Stuart Papers* in Rome, but these were seized by the Vatican, and presented to the Prince Regent. He wrote a *Life of Lord George Gordon* (1795).

Watson, THOMAS (?1557-92), English poet and scholar, was born in London. His first efforts were in Latin verse, in which he possessed amazing facility, and among other works was a Latin translation of Sophocles's *Antigone*. His first English poem (1582) was entitled *Watson's Passions*, manifesting the true frenzy of love; but whatever his verse had it lacked passion. In 1590 he published an eclogue in Latin and English on Sir Francis Walsingham. *The Tears of Fancie* appeared in 1593. Professor Arber issued *Watson's Poems* (1870).



William Watson.

(Photo by Elliott & Fry.)

Watson, WILLIAM (1858), English poet, is a native of Burley in Wharfedale, Yorkshire. His early verses were printed in the *Liverpool Argus* in 1875. His first book, *The Prince's Quest*, appeared in 1880, and his subsequent publications are *Epigrams of Art, Life, and Nature* (1884); *Wordsworth's Grave, and other Poems* (1890); *Poems* (1892); *Lyric Love* (an anthology, 1892); *Lachrymæ Musarum* (1892); *Excursions in Criticism* (1893); *The Eloping Angels* (1893); *Odes, and other Poems* (1894); *The Father of the Forest* (1895); *The Purple East* (1896); *The Year of Shame* (1896); *The Hope of the World* (1897); *Collected Poems* (1898);

New Poems (1902); *For England* (1903); *Selected Poems* (1903); and *Poems* (1904). The publication of *Epigrams of Art, Life, and Nature* marked his adoption of a style in poetry to which he has remained constant—the epigrammatic and the philosophical, that is to say, rather than the lyrical. But his thoughts are almost all clothed in dignified and restrained language. In the sonnets (collected as *The Purple East* and *The Year of Shame*) that he wrote on

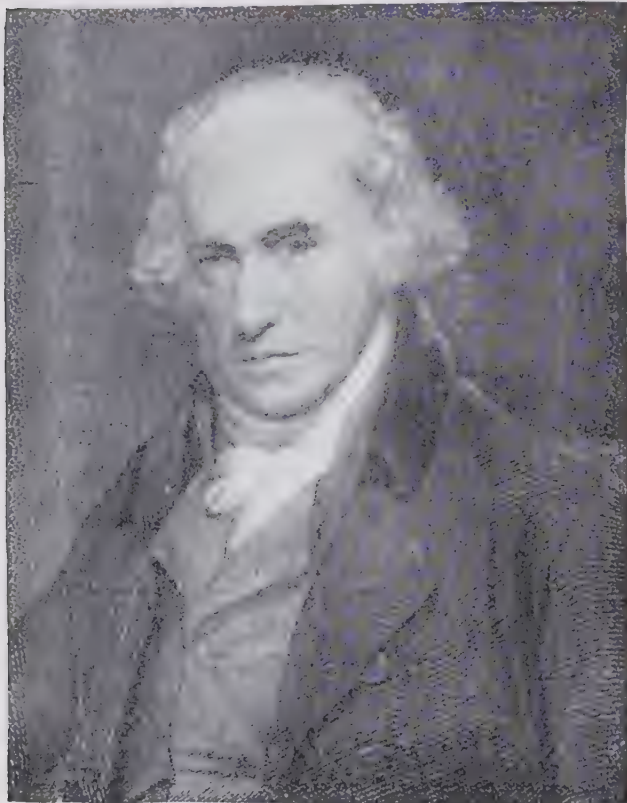
ber of the Royal Scottish Academy (1829), exhibiting there from 1830. He was elected A.R.A. (1841), and R.A. (1851), being finally elected president of the R.S.A. in 1850, and knighted. He was also an exhibitor at Burlington House, London, from 1827 till his death. His portraits of *David Cox* (Birmingham Art Gallery), *Sir Walter Scott* (National Gallery of Scotland), *Sir David Brewster* and *De Quincey* (National Portrait Gallery) are among his most fa-

people, on s. shore of Port Jackson, 7 m. by road N.E. of Sydney. Pop. (1901) 1,200.

Watt is the practical electric unit of power. It equals 10^7 c.g.s. electro-magnetic units of power, and is the power conveyed when a current of one ampère passes through a conductor whose ends differ in potential by 1 volt, or when an ampère flows through a resistance of 1 ohm. Watts are measured as the numerical product of amperes and volts. $\text{Watts} = E \times C = C^2 \times R = E^2 \div R$. 746 watts = 1 horse-power.

Watt, SIR GEORGE (1851), Scottish botanist, born at Old Meldrum, Aberdeenshire. After acting as assistant professor of botany at Aberdeen (1871-3), he obtained the botany chair in Calcutta University (1873), afterwards filling several government appointments. He has been reporter on economic products to the Indian government since 1887, and since 1894 has had the control of the Calcutta Industrial Museum. His works include *A Dictionary of the Economic Products of India* (1889-96); (with Harold Mann) *The Pests and Blights of the Tea Plant* (2nd ed. 1903); and *Indian Art at Delhi* (1903).

Watt, JAMES (1736-1819), Scottish engineer, and the improver and generally reputed inventor of the steam engine, was born in Greenock, and was sent to Glasgow (1754) to learn the making of mathematical instruments. After an attempt to settle in London, the university of Glasgow appointed him its mathematical instrument maker. He also acted as a surveyor of canals and engineer for the city waterworks; but the turning point of his life occurred when a Newcomen fire (i.e. steam) engine was sent to him by the university to repair. This suggested to Watt the idea of the separate condenser. He formed a partnership with Roebuck of the Carron Iron Works; but Roebuck got into financial difficulties, and transferred his share in Watt's invention to Boulton of Soho, Birmingham. The firm of Boulton and Watt was formed (1774), and an extension of the patent till 1800 was obtained in 1775. Watt's engine rapidly replaced Newcomen's, being more efficient and more economical. Watt made a long series of further improvements on the steam engine, including the expansion principle, parallel motion, and sun and planet motion, and finally the application of the governor. He made experiments in the direction of locomotive engines, but opposed strenuously Trevithick's ideas regarding high pressure. In addition to this, Watt was an ardent student of chemistry, and it was



James Watt.

(Portrait by Sir W. Beechey.)

the occasion of the Armenian massacres of 1895, passion and invective threaten to carry him away; but in his later work dignity and purity of style have reasserted themselves.

Watson-Gordon, SIR JOHN (1788-1864), Scottish portrait painter, was born in Edinburgh, nephew of George Watson, first president of the Scottish Academy, and assumed the name of Gordon. He exhibited from 1826 at the Royal Institution, Edinburgh, and was admitted mem-

ber of the Royal Scottish Academy of fine arts was instituted in his memory at Edinburgh (1879).

Watsonia, a genus of S. African bulbous plants belonging to the order Iridaceæ. They bear long, somewhat rigid leaves, and sessile flowers, one to the spathe. They are easily cultivated as greenhouse plants in a sandy loam with peat. They do better planted out in a frame than when grown in pots.

Watson's Bay, New South Wales, favourite resort of Sydney

long maintained on his behalf that he discovered the composition of water. He invented copying-ink (1780). See Smiles's *Lives of Boulton and Watt* (1865), Muirhead's *Mechanical Inventions of James Watt* (1854), and Pemberton's *James Watt* (1905).

Watt, ROBERT (1774-1819), Scottish bibliographer, was born in Ayrshire, and licensed as a physician. After he began to deliver lectures on medicine in Glasgow (about 1810) he compiled a *Catalogue of Medical Books* (1812), for the use of his students, which was the starting point for his elaborate *Bibliotheca Britannica*, which appeared in 1824.

Watteau, ANTOINE (1684-1721), French painter, born at Valenciennes. In 1702 he went to Paris, and worked on the decoration of the Luxembourg palace, where a study of Rubens's pictures revealed to him his own delight in sensuous exuberance and joy of life. De la Fosse gained entrance for him to the Academy (1717), and the patronage of Pierre Crozat, who introduced him to fashionable personages. Many of the figures of his *Fêtes Galantes* and *Fêtes Champêtres* are drawn from a company of Italian comedians, whose natural gestures he painted in delicate, broken tones of red, pale blue, and white. The gaiety of his art lies mainly in his sunlit colours and great purity of tone; its beauty in his grace of line and delicate arrangement of background. His finest pictures are to be found in the La Caze Collection, Louvre; in Sans Souci at Potsdam; in Berlin; and in the Wallace Collection in London; and a good collection of his drawings is in the British Museum. De Goncourt published a *Catalogue Raisonné* of his works in 1875. See *Lives* by Mollett (1883), Volbehr (1885), Dargenty (1891), and Mantz (1892).

Wattle. See ACACIA.

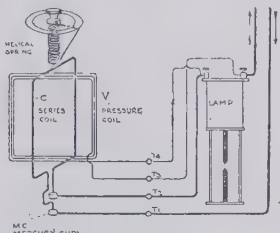
Wattle-bird (*Anthochaera carunculata*), one of the honeyeaters. It is confined to Australia, but another species is Tasmanian. The distinguishing feature is the elongation of the wattles, hence the name.

Wattmeter, an instrument for measuring the units of electrical power, or the rate at which work is being done between two points in a circuit.

Watts = volts \times amperes.

Volts are usually measured by a voltmeter, and amperes by an ammeter. Hence if there be an ammeter in the circuit between the points and voltmeter across the points, the watts may be got by multiplying the readings of the voltmeter by those of the ammeter. Hence an instrument which is to measure the watts must partake of the nature of both

these instruments. It must consist of a pressure coil of thin wire placed across the mains or feeds, and a coil of thick wire for measuring the current strength placed in series with the lamps or other apparatus using up the electrical energy. The sketch shows the arrangement diagrammatically. Siemens's wattmeter is an instrument constructed on this principle.



Wattmeter.

C, the series coil, is of thick wire, and is free to swing against the action of the helical spring, while contact is effected by the free ends moving in cups of mercury connected with the feeds. V, the pressure coil, is of fine wire, and is fixed. When no current is passing, coil C is at right angles to coil V. V consists of many turns of thin wire of sufficient resistance to prevent the pressure being altered when the coil is connected across the dynamo terminals; C is of thick wire of low resistance, so that the current strength may be little altered by its insertion in series with the lamps. When this apparatus is connected to the circuit and current passes through both coils, C tends to turn so that its magnetic field may become parallel to that of V. The turning of the movable coil is proportioned to $E \times C$ —i.e. to the watts. Hence by accurate calibration the instrument may be made to indicate the watts used. In this form of instrument there is a considerable amount of self-induction in the coil V, which interferes with accurate working when used for alternating currents. In more recent forms the heavy current coil is fixed, and the fine wire coil is made small and light, being either suspended by fine wires, or rotating on steel centres in jewelled bearings, and controlled by flat spiral springs. A large non-inductive resistance is joined in series with the fine wire coil. (See ELECTRIC CIRCUIT—Alternate Currents.) Refer to *Electrical Engineering Measuring Instruments*, by Aspinall Parr (1903).

Watts, ALARIC ALEXANDER (1797-1864), English poet, was born in London, took to journalism, and brought out (1824) the *Literary Souvenir*, for which

he secured the co-operation of Scott, Wordsworth, Coleridge, Praed, and others. He published two volumes of his own verse, *Poetical Sketches* (1822) and *Lyrics of the Heart* (1850). In 1854 he received a pension from the civil list. See *Life* by his son (1884).

Watts, GEORGE FREDERICK (1817-1904), English painter and sculptor, was born in London. His first exhibited works were two portraits of ladies, and a picture of a wounded hero, at the Academy in 1837. In 1842 Watts gained a prize of £300 in the competition for the decoration of the new Houses of Parliament, with his *Caractacus being led in Triumph through the Streets of Rome*, which enabled him to spend the next two years in Florence. Here he laid the foundation of his lifelong friendship with Lord Holland, then British ambassador, and for whom he painted a portrait of Lady Holland (exhibited 1848). In Florence he steeped himself in the Italian art of the renaissance, being chiefly influenced by the Venetians, especially Tintoretto, from whom he learned colour. He returned to London in 1846, and took part in another House of Lords competition, this time winning a prize of £500 with a cartoon, *Alfred inciting his Subjects to prevent the Landing of the Danes*, which led to a commission from the government to paint the *St. George and the Dragon* fresco, in the Hall of Poets. About this time Watts struck out into the symbolical work which forms his message to the age—the power of love and the fallacy of the fear of death, the danger of riches and the cruelty of greed. The most notable of this group are *Faith*, *Hope*, and *Charity*, *Love and Life* (1885), *Love and Death* (1877-96), *Love Triumphant* (1898), the trilogy of *Eve*, three pictures which were at once among the triumphs of modern English painting (especially the lovely form of *Eve Repentant*), and in themselves almost an epic of humanity. Watts executed numerous portraits of the distinguished men of his day, including Gladstone, Lord Salisbury, the Duke of Devonshire, Tennyson (the finest of all), Lord Stratford de Redcliffe, Lord Lyndhurst, Swinburne, and Garibaldi. Although Watts's sculpture amounts to only some half-dozen pieces, yet these works are characterized by grandness of conception, nobility in style, and boldness and breadth of execution. Such works are *Hugo Lupus*, at Eaton Hall, and *Bishop Lonsdale*, in Lichfield Cathedral. Watts presented the greater part of his work to the nation. He was elected an Academician in



A Picture by G. F. Watts, R.A.—'Love and Death.'
(Photo by Holtyer.)

1867. See Monkhouse's *British Contemporary Artists* (1889), Bate-man's *G. F. Watts* (1901), and Mrs. Russell Barrington's *G. F. Watts: Reminiscences* (1905).

Watts, HENRY (1815-84), English chemist, was born in London. In 1846 he became assistant to Fownes, professor of chemistry in University College, London, but an impediment of speech prevented his academic preferment. He translated (1848-72) Gmelin's *Handbuch der Chemie*, and edited the Chemical Society's *Journal* from 1861. In 1863-8 he brought out a *Dictionary of Chemistry*, which (revised) still holds the field. He also brought out editions of Fownes's *Chemistry*.

Watts, ISAAC (1674-1748), English sacred poet, was born at Southampton, and was a private tutor from 1696 to 1702. He was at the same time assistant to Dr. Chauncy, Independent minister, whom he succeeded in 1702. Watts's authorship begins with *Horæ Lyricæ* (1706), and is continued in *Hymns* (1707), *Psalms and Hymns* (1719), and *Divine and Moral Songs for Children* (1720). The best of his sacred lyrics—simple, direct, and warmly evangelical—rank among English classics. Many of the children's hymns are excellent. Watts's *Logic* (1725) was for a time a university text-book. He followed it in 1741 with a supplement, *Improvement of the Mind*. His *The World to Come* (1738) was for long a household book. Watts's collected *Works* (6 vols.) appeared in 1753. See Johnson's *Lives of the Poets* (1779-81), and *Memoir* by Thomas Gibbons (1780). A library edition of the *Works*, with prefatory life (9 vols.), was published in 1812. Thomas Milner edited *Life, Times, and Correspondence* (1834). Southey prefixed a memoir to an edition of *Horæ Lyricæ* (1837).

Watts-Dunton, WALTER THEODORE (1836), English critic and poet, assumed late in life the additional name of Dunton, was born at St. Ives, Huntingdon. For twenty years or more he lived in Upper Putney, in companionship with his friend Mr. A. C. Swinburne, the poet. Whilst still a boy he was brought into touch with gipsy life, and this lighted a flame in his imagination which was publicly revealed in the romance of *Aylwin* (1898), and in the dialect narrative poem *The Coming of Love* (1897). In early manhood Theodore Watts became the friend of George Borrow, and this was another potent influence on his imaginative energy. In 1874 he joined the staff of the *Examiner*, then under the editorship of William Minto; and in the following year he began to contribute to the *Athe-*

neum, where for twenty years he wrote with such distinction that the anonymous critic of that periodical became generally recognized as the foremost English critic of literature since Matthew Arnold, and with a range of intellectual interest and catholicity of taste which made his critical contributions as unique in substance as they were unmistakable in style. For the *Encyclopædia Britannica* and the *Supplement* he wrote several essays of exceptional value—e.g. those on the sonnet, the rondeau, and other metrical forms, the studies of Vanbrugh and Wycherley, and the critical-biographical articles on George Borrow, Matthew Arnold, and Dante Gabriel Rossetti. But his most important contribution was the treatise on poetry and the first principles of the poetic art. Nothing so complete and illuminative had appeared before.

Mr. Watts-Dunton also wrote several biographical and critical summaries in *Ward's English Poets* and *Chambers's Encyclopædia*. He did not, however, become widely known as a poet till the publication in 1897 of *The Coming of Love: Rhona Boswell's Story*. Its absolute unconventionality, its fresh naturalness, its vivid truth to nature, as well as its genuine romantic atmosphere and unmistakable poetic energy, have ensured for it an extraordinarily wide appreciation. Great as was the success of *The Coming of Love*, however, it was nothing to that of *Aylwin*, published in 1898. This is a romance of literary life, with real persons and some unreal (in both senses of the term); a romance of gipsy life, sometimes as it is or was, sometimes as it is not nor ever was; an autopsychical record, and yet not autobiographical; 'a scientific and imaginative presentment of life' (as has been claimed for it) and 'a handbook of contemporary mysticism' (as it has been defined). He has also published *Jubilee Greeting at Spithead to the Men of Greater Britain*, and other *Poems* (1897), and edited Borrow's *Lavengro and Romany Rye*. See the 'Watts-Dunton' number of the *Bookman* (1904), and Mr. James Douglas's *Life* (1904).

Wauchope, ANDREW GILBERT (1846-99), British general, was born at Niddrie, near Edinburgh. He saw active service in Ashanti (1873), and was wounded; took part in the Boer war (1880) and the Egyptian campaign (1882); ascended the Nile with the expedition to relieve Gordon in 1884; and was at Omdurman in 1897. During the Boer war of 1899-1902 he was in command of the Highland Brigade, and was killed while leading the Highland Brigade at Magersfontein.

Waugh, EDWIN (1817-90), English poet, was born at Rochdale, Lancashire, and devoted himself to literature. He was a powerful singer in the Lancashire dialect, which he handled with loving care, but yet with such discrimination that the outsider is never wearied. Of his prose works the best are *Factory Folk during the Cotton Famine*, *Besom Ben Stories*, and *The Chimney Corner*; while *Lancashire Songs*, collected in 1859, have had an enduring popularity. He was not so successful when he ventured beyond the Lancashire dialect.

Waukegan, summer resort, cap. of Lake co., Illinois, U.S.A., on w. shore of Lake Michigan, 35 m. N. of Chicago; has a good harbour. Brass and iron goods are manufactured. Pop. (1900) 9,426.

Waukesha, health resort, cap. of co. of same name, Wisconsin, U.S.A., on Little Fox R., 15 m. W. of Milwaukee; has magnesian springs, and is the seat of the Carol Presbyterian College. There are bridge-building works. Pop. (1900) 7,419.

Wausau, city, Wisconsin, U.S.A., co. seat of Marathon co., 157 m. N.W. of Milwaukee, on Wisconsin R.; with timber industries and flour mills. Pop. (1900) 12,354.

Wave. The most familiar kind of wave is the water wave or ripple, which is obviously a state of motion passing over the surface of the water with a certain speed. The rate of propagation of the wave is something quite different from the rate of motion of the water, every part of which simply moves up and down and slightly forward and backward as the wave passes. Again, water waves may differ in wave length—that is, in distance between corresponding parts of successive waves, say, from crest to crest. They may differ in period—that is, in the time each particle of water takes to go through all its motions as one wave passes it. This periodic time is also the time the wave itself takes to move through the distance equal to the wave length; hence the very important relation, true of all wave motions, that the velocity of propagation of a wave is equal to the wave length divided by the periodic time. Finally, waves may differ in form. Similar characteristics are possessed by all kinds of wave motion, which may be generally defined as the propagation of a particular configuration or state of strain through a system of particles or other material system. The existence of wave motion requires first a disturbance, and second a recovery, of the system towards its original undisturbed condi-

tion. The disturbance of the hydrostatic level of water is followed by a natural tendency to recover that level condition, and there are two forces which aid in this recovery. The one is gravity, or the weight of the heaped-up water; and the other is the surface tension, which produces an inward pressure over every curved surface. The latter becomes important only when the waves are very short. Kelvin distinguishes between ripples and waves—the ripples being short and running mainly by surface tension, while the waves are propagated mainly by gravity. The shorter the ripple the quicker it runs. On the other hand, gravity makes the longer waves travel more quickly. There is a critical wave length, about seven-tenths of an inch, for which gravity and surface tension have equal influence, and the wavelet ripple of this wave length travels with the minimum speed of 9.34 inches per second. The product of the wave lengths measured in inches of any pair of corresponding wave and ripple is .505. Ripples so tiny as to be unobservable except in their effect in slightly dimming the surface of a hitherto perfectly still sheet of water will be propagated over the surface with considerable velocity.

Somewhat similar to the propagation of ripples by surface tension is the propagation of transverse waves along a stretched string. In this case, however, the speed of propagation is the same for all wave lengths. Its value is given by the formula $v^2 = T/D$, where T is the tension and D the mass in unit length of the string. The velocity being constant for the same tension, it follows that the wave length is proportional to the period. It is more convenient, when dealing with rapid vibrations, to measure rate of vibration by the number of vibrations per second instead of the time of one vibration. This quantity is called the frequency, and is the reciprocal of the period. Thus we have for the stretched string the important result that under constant tension the wave length is inversely as the frequency. See under SOUND for a further discussion of this relation.

Any molecular disturbance in a material substance will be propagated through it as an elastic disturbance, and a rhythmic sequence of such disturbances will form a train of waves. The disturbance may be a change of density or a change of form, or a change involving both. In fluids such as air or water the elastic disturbance can be only one of change of bulk or density. It is then called a pure condensational

rarefactional wave. The most familiar illustration of this kind of wave is the sound wave in air, the speed of propagation of which is measured in terms of the formula $v^2 = E/D$, where D is the density and E is the resistance to compression or the incompressibility of the air. A similar formula holds for the propagation of condensational waves through water. The greater density of the water is overbalanced by its much greater incompressibility as compared with air, so that sound travels in water with a speed of 4,700 feet per second, whereas the velocity of sound in air is only 1,090 feet per second.

When we pass to the case of solids, we have to do with two kinds of elasticity—the rigidity, or resistance to change of form, and the incompressibility, or change of bulk. In all cases the velocity can be expressed by means of a formula of the type $v^2 = E/D$, where D is the density and E is the particular value for the resistance to the strain involved. Thus there is a purely distortional wave, whose velocity depends upon the rigidity of the material; and there is a compressional wave, whose velocity depends upon both the rigidity and the compressibility. The latter travels at a rate which may be in certain cases twice the rate of the former. But in addition to these there is a third type of wave, which travels along a thin, long bar of the material, say a copper or iron wire. This, which may be called the longitudinal wave, depends upon Young's modulus. Its velocity is always higher than the velocity of the distortional wave, and may be higher than that of the compressional wave. Lord Rayleigh has also pointed out the existence of a surface wave propagated along the face of an extended elastic solid. Its velocity is somewhat smaller than that of the compressional wave. This surface wave has never been observed, except possibly in the case of earthquakes, which give rise to surface waves passing outward over the earth's surface with speeds varying from two to three miles a second.

It is generally admitted that the wave motion which constitutes light consists of purely transverse vibrations. If we consider the æther or luminiferous medium to be an elastic solid of extreme tenuity, we must assume it to be incompressible so as to get rid of the compressional wave. The high velocity of light (186,400 miles per second) would then imply a high rigidity or a very small density, or both combined. There are difficulties in realizing how a purely distor-

tional wave can begin to be propagated in an absolutely incompressible medium. As Kelvin has expressed it, it is infinitely improbable that the æther can be infinitely incompressible. Yet we have no evidence in optical phenomena of there being any compressional wave. If, however, Maxwell's theory of the electric nature of light be true, we must regard the vibrations which constitute light as being electric and magnetic. Such vibrations may exist quite apart from any elastic properties that may be assigned to the medium. The experimental proof by Hertz, that electro-magnetic waves do exist, and are propagated with a velocity approximately equal to that of light, goes far to establish the truth of Maxwell's theory. Our eye recognizes the slow oscillatory motion of waves and ripples on water; our pulses beat in time with waves propelled through the arteries and blood-vessels; our seismometers record vibrations of the earth's surface; our ear is sensitive to the fairly rapid periodicity of sound waves; we can construct apparatus to record for us the still more rapid vibrations of electric distribution which form the basis of wireless telegraphy; our eye responds to the 500 million million vibrations of light which stimulate it every second of time; and by appropriate means we can demonstrate still more rapid vibrations to which our eye is not sensitive. Passing down to slower periodicities, we have the tidal waves twice a day, the annual variation of the seasons, the eleven-year sun-spot cycle—all of which, if not distinct wave motion, can be represented diagrammatically in wave form. Water waves are discussed in Lamb's (1895) and in Bassett's *Hydrodynamics* (1888); sound waves in Rayleigh's *Theory of Sound* (1894-6); æther waves in Larmor's *Matter and Ether* (1900), and treatises on light generally; electric waves in Maxwell's *Electricity and Magnetism* (1892); J. J. Thomson's *Recent Researches in Electricity and Magnetism* (1893); Heaviside's *Electrical Papers* (1892); and Drude's *Optics* (1902).

Waverley, suburb of Sydney, N.S.W., 4 m. E. of the city; with boot and baking-powder factories. Pop. (1901) 12,343.

Wavre, tn., Brabant prov., Belgium, 16 m. S.E. of Brussels; has tanneries and breweries, and manufactures paper, lace, etc. Here, on June 18, 1815, the Prussians prevented Grouchy from joining Napoleon. Pop. (1900) 8,069.

Wax includes various products derived from the animal, vegetable, and mineral kingdoms. In general, waxes are lighter than

water; melt on heating to a limpid liquid, and are combustible, being not unlike fats, but are harder and more lustrous in appearance. They are insoluble in water and cold alcohol, but are more or less soluble in boiling alcohol, from which they often crystallize. They also dissolve in ether, chloroform, petroleum spirit, and turpentine, and are normally white, although some of them—such as beeswax, laurel wax, carnauba wax—contain in their crude form a little colouring matter. In chemical composition the animal and vegetable waxes are, as a rule, esters, formed by the union of fatty acids and alcohols of high molecular weight, whilst the mineral waxes are hydrocarbons. The most important waxes are beeswax, which is a secretion of bees, derived by them from flowers. It consists substantially of 12 per cent. of cerotic acid, along with 88 per cent. of myricin, which is myricyl palmitate. It can be bleached by exposure to air and moisture, or by the cautious use of oxidizing agents. Chinese wax, composed of ceryl cerotate, and produced by the attacks of an insect (*Coccus pelti*); Japan wax, glyceryl palmitate, from the seeds of *Rhus succedanea*; carnauba, or Brazilian wax, a complex mixture of high alcohols, acids, and hydrocarbons from the leaves of *Corypha cerifera*; and myrtle wax, from the berries of *Myrica cerifera*, are the principal waxes of vegetable origin. Spermaceti is nearly pure cetyl palmitate, and is a hard, very glistening, pearly wax, found in the head of the sperm whale, *Physeter macrocephalus*. Ozokerite is a natural hydrocarbon wax found in Galicia, and is very largely used in candle-making. In a semi-refined condition it forms a yellow granular wax, known as ceresin, and used as a substitute for beeswax. Paraffin wax is also a hydrocarbon, and is obtained from the crude oils got on distilling the shales found in Scotland, and also from American petroleum. When refined it is white, semi-transparent, and in the best grades hard, and with a sonorous ring. It is chiefly used for the manufacture of candles, in making waxed papers, and as an insulator. Waxes are also employed in the finishing of textile fabrics, making of ointments, pomades, furniture polishes, waxed paper, and medicinal plasters, as well as for laundry and household uses. See SEALING WAX, and for books of reference OILS AND FATS.

Wax-bill. See WEAVER-BIRDS.

Wax - myrtle (*Myrica cerifera*). See MYRICA.

Wax-palm, a name given to various species of palm, especially to *Copernicia cerifera* or *Corypha cerifera*, the wax-palm or carnauba palm of Brazil and other parts of tropical America. The leaves of this plant, which are coated with wax, are cut off when young, dried in the sun, and then shaken. The wax falls as a fine powder. This powder is then melted and formed into cakes. The wax is extensively used in the manufacture of candles. The so-called palm-tree wax of commerce is obtained from two plants belonging to allied genera—*Klotzstockia cerifera* and *Cerozylon andicolum*. These palms secrete the wax on their stems, from which it is obtained by scraping. One tree is said to yield on an average about twenty-five pounds of wax.

Wax-plant, or HONEYWORT (*Cerinth major*), a name given to plants belonging to the genus *Cerinth*, a subdivision of the order Boraginaceæ. The popular name is derived from an old idea that bees visit the flowers for wax.

Wax-tree, a name given to *Vismia guianensis*, the American gamboge or gutta-gum tree. This little tree or shrub is a native of tropical America, and requires stove heat in Britain. It bears corymbs of yellowish flowers in late summer.



Waxwing.

Waxwing (*Ampelis garrulus*), a bird which breeds within the Arctic circle, but is a not infrequent visitor to Great Britain. It reaches a length of about seven and a half inches, and has an erectile crest, long pointed wings, and a short tail. The general colour of the plumage is grayish brown, but the head is marked with black and chestnut, and the wings and tail are blackish, with yellow and white markings. About eight of the secondary feathers of the wing, and in some cases some of the tail feathers, have red waxlike tips at the

shafts, hence the common name. Waxwings feed on insects and berries, and have a trilling note. Waxwings belong to a peculiar family, the Ampelidæ, and are probably related to the shrikes.

Waxy or Albuminoid Disease, a degeneration resulting usually from long-continued suppuration or from chronic wasting disease. The organs affected most frequently and most markedly are the liver, spleen, and kidney; but the lymphatic glands, the intestinal mucous membrane, the pancreas, the thyroid gland, the heart, and the lungs may also share in the degeneration. In an advanced stage of the disease the parts present the appearance of having been soaked in wax or similar translucent material. The general symptoms are anæmia, debility, and cachexia. Enlargement of the liver is usual, and the degeneration of the kidney leads to albuminuria, dropsy, and uræmia. The prognosis is always extremely bad, and is hopeless when the disease is far advanced. A liberal diet, containing abundance of nitrogenous food and potassium salts, should be prescribed. The drugs chiefly indicated are iron, cod-liver oil, and potassium salts.

Way, RIGHT OF. See RIGHT OF WAY.

Wayao, or AJAWA, a Bantu tribe, the most important native people of Mozambique. They have also spread into Nyasaland and German E. Africa. They are a hard-working race, but are warlike and addicted to cannibalism. Chuma, the servant of Dr. Livingstone, belonged to the Ajawa.

Wayfaring Tree, or HOBBLE BUSH (*Viburnum lantanoides*), is an American shrub with a straggling habit. It bears serrated ovate leaves, and in May cymes of large handsome white flowers, followed by dark-red berries.

Wayland the Smith, a hero in Germanic mythology. After learning the art of forging weapons, he went to the trolls, who taught him smelting and the secrets of the mixture of metals. He fell into the power of King Nidung, who mutilated his feet. Wayland terribly avenged himself, and then fled to Valhalla by making himself a pair of wings. He is said to have resided for a time in England, and his 'cave' is shown at Ashdown in Berkshire. See Simrock's *Wieland der Schmied* (1835) and Müller's *Mythologie der deutschen Heldensage* (1886).

Wayne, ANTHONY (1745-96), known as 'Mad Anthony,' American general during the war of independence, was born at East-town, Pennsylvania. The war fired his blood, and raising a regiment

of volunteers he went to Canada, where he did good work at Three Rivers. He next distinguished himself at Ticonderoga. After that he became associated with Washington, gained laurels at Brandywine, Germantown, Valley Forge, and Monmouth. Though defeated at Paoli, he retrieved the reverse by the brilliant success of Stony Point. After the war he was appointed general-in-command of the army, gained victories over the Indians of the north-west frontier, and signed an important treaty with them.

Ways and Means, COMMITTEE OF. In the House of Commons all loans, duties, taxes, tolls, revenue, and imposts must be first considered by a committee of the whole house, whilst the imposition of taxation for the service of the year is reserved for the Committee of Ways and Means. The chairman is elected by the House of Commons on the assembling of every new Parliament. He also acts as deputy Speaker.

Wazan, tn., Morocco, 45 m. N.W. of Fez; is a holy city and the residence of the grand shereef. Pop. 10,000.

Wazirabad, munic. tn., Gujarawala dist., Punjab, India, 60 m. N.W. of Lahore; manufactures steel and iron and wax. The Chenab is spanned opposite Wazirabad by a fine railway bridge, the Alexandra bridge (1876). Pop. (1901) 18,069.

Waziri, a large and semi-independent Afghan nation who occupy the Waziri Mts. from Thal to the Gomal Pass, near the Indian frontier. There are, according to Lord Roberts, 40,000 fighting men; Macgregor and other authorities give from 44,000 to 50,000.

Weald, the triangular area lying between the North and South Downs, and forming part of Sussex, Surrey, Kent, and Hampshire. It is composed mainly of Lower Cretaceous strata. The Wealden beds cover most of the district, and are subdivided into the Hastings Sand and the Weald Clay. They form the back of a long anticline, which is the principal structural feature of the geology of this part of England. The Hastings Sand is from 1,000 to 2,000 ft. in thickness. At the base of it lies the Ashdown Sand, which forms Crowborough Beacon. Over this comes the Wadhurst Clay, containing layers of hard concretionary calcareous sandstone—the Tilgate Stone. The uppermost part of the series is the Tunbridge Sand, certain beds of which have yielded remains of iguanodon and other fossil reptiles, first discovered by Dr. Mantell. The Weald Clay contains occasional shelly or are-

naceous beds full of freshwater mollusca (*Viviparus, Unio*). Beds of the same age are exposed in the Isle of Wight near Atherfield Point, and at Swanage in Dorset, and are continued across the English Channel into the north of France.

Wealth. From time to time numerous estimates have been made as to the wealth of the chief countries of the world, and the ratio *per capita*. The latest calculation was made in 1895, when the following figures by Mulhall were accepted as approximately accurate, in millions of pounds sterling:—The United Kingdom, 11,806; France, 9,690; Germany, 8,052; Russia, 6,425; Austria, 4,512; Italy, 3,160; Portugal, 2,380; the other European countries, 5,315—a total for Europe of 51,340. The wealth of the United States was at the time estimated at 16,350; Canada, 1,003; Australia, 1,076; and Argentina, 616.

The following table shows the estimates formed at previous dates of the wealth of England and Wales, Great Britain, and the United Kingdom:—

Date.	Millions pounds sterling.	Comprising.	Authority.
1600	250	England and Wales.	Petty.
1703	490	" "	Davenant.
1774	1,100	" "	Young.
1800	1,740	Great Britain.	Beeke, Eden.
1812	2,190	United Kingdom.	Colquhoun.
1822	2,600	" "	Lord Liverpool.
1833	3,750	" "	Pablo Pebrer.
1840	4,100	" "	Porter.
1865	6,113	Great Britain.	Giffen.
1875	8,548	" "	"
1885	10,037	" "	"

How these figures are obtained, and the various classes and sources of wealth which they comprise for every country, will be found in M. G. Mulhall's great work, *The Dictionary of Statistics* (4th ed. 1899), and his *Industries and Wealth of Nations* (1896), where the subject is fully discussed. See also Clark's *Distribution of Wealth* (1899), and Carver's *The Distribution of Wealth* (1904).

Wear, a river of England, which rises on the western border of Durham, flows through the city of Durham, and empties into the North Sea at Sunderland, 65 m. from its source. A great trade in coal export is carried on at Sunderland, which also is the seat of a shipbuilding industry almost rivalling that of the Tyne.

Weasel (*Mustela vulgaris*), a fierce carnivore, belonging to the same family as the stoat, polecat, and marten. It is from six to eight inches in length, the tail

being from two to two and a half inches. The food consists of rats, mice, voles, shrews, as well as small birds, and even poultry, game-birds, and rabbits. The body is elongated and snakelike, and thus the weasel is admirably fitted for worming its way through dense herbage and into the holes and hiding-places of its prey. The colour is mahogany brown above



Weasel.

and white below. Occasionally weasels turn quite white in winter. The animal extends throughout the whole of Europe, N. and Central Asia, and a large part of N. America. Four or five young are brought forth at a time, and there may be two or three litters in the year.

Weather. See METEOROLOGY. **Weatherboards,** boards used to form the outsides of wooden

buildings. If horizontal, they should overlap to keep out the rain; if vertical, they should be grooved and tongued.

Weather Forecast. The earliest forecasts of the weather occur in the writings of Aristotle, Theophrastus, and Aratus; but it was not until the discovery of the barometer, in the 17th century, that any attempt was made to draw definite conclusions from physical data. The first proposal for the use of the telegraph in this connection was by Carl Kriell of Prague in 1842, and in 1849 Professor Henry of America had inaugurated a system whereby a concise summary of the weather was telegraphed every morning by the operators of the various telegraph companies. The first weather maps actually published embraced the period from Aug. 8 to Oct. 11, 1851, and were shown day by day in the great exhibition of that year by the Electric Telegraph

Company. The first government to collect data by telegraph was Holland in 1855, France following in the same year; while England came third in 1860, the earliest daily weather report issued by the Meteorological Office appearing in the *Times* of Sept. 5. In August 1861 Admiral Fitzroy began to issue forecasts of coming weather. Most countries have now a central office, to which a large number of stations scattered over the country send information by telegraph of the height of the barometer and thermometer, the direction and force of the wind, and other particulars pertaining to the meteorological conditions prevailing at a given hour of the day. The data on arrival at the central office are charted on maps, and from these it is possible to issue forecasts of the coming weather.

In the United States, where the systems can be followed from their genesis in the Rocky Mts. until they pass away over the Atlantic, a high percentage of successful forecasts is attained; but in the British Is. and in France, which have no stations to the west of them, weather prediction is extremely difficult. For the British Is. during the ten years 1890-9 the percentage of complete success varied from 43 per cent. in 1892 to 59 per cent. in 1893, the average for the ten years being 53.5 per cent. (See *Report of the Meteorological Council* for year ending Mar. 31, 1900, p. 14.) Forecasting is much more certain for the midland counties and the south of England than for the south of Ireland and the west of Scotland, owing to the rapidity with which weather changes take place in the latter districts. See R. H. Scott's *Weather Charts and Storm Warnings* (1837).

Weather-helm. A ship is said to carry weather-helm when she is inclined to come too near the wind, and therefore requires the helm to be continually put a little to leeward.

Weathering, the result of the changes, mechanical and chemical, produced by the action of the atmosphere on exposed rock surfaces. Even the hardest rocks are gradually disintegrated and partly dissolved, leaving earthy or sandy residues. Alternate heat and cold expand and contract the minerals in the rocks, lessening their cohesion; moisture dissolves away the soluble minerals and enters into combination with others, producing hydrates, which are softer and less compact than the original substances; carbon dioxide (and in towns sulphuric, hydrochloric, and nitric acids) attacks many of the ingredients of rocks; frost

breaks open the pores and crevices; wind carries away the fine debris, and uses it to wear down the exposed surfaces; lichens and mosses attach themselves, and facilitate disintegration and solution; marine animals bore into the surface. Rocks composed largely of quartz, such as quartz-

ize; limestones dissolve readily, and are the most soluble of all rocks; dolomite is distinctly more durable than limestone. Surfaces of fine marble were found to lose one-third of an inch in a century in Edinburgh; the best English dolomite in London lost one-eighth of an



Weaver-birds and their Nests.

1. *Philoterus socius* and nest. 2. *Ploceus baya*. 3. *Sitagra (Hyphantornis) capensis*. 4. *Vidua paradisae*, male, in breeding plumage. 5. *Munia erythraea*. 6. *Estrilda astrildae*. 7. Nest of Indian weaver-bird.

ites and pure sandstones, are very durable; cherts and flints are somewhat less so; granites and acid igneous rocks generally are very resistant to weathering, but their felspar and mica decompose and split up in course of time, especially in severe climates; slates weather very slowly, but clays and marls rapidly pulver-

ize in fifty years; in St. Petersburg, polished faces of coarse granite retain their freshness only for a short time. Much depends on climate, prevailing winds, presence of chemical works or furnaces, and amount of moisture. The south-west side of buildings in London weathers twice as rapidly as the north-east.

Weatherly, **FREDERIC EDWARD** (1848), English song-writer, was born at Portishead, Somerset. Among his songs are *Nancy Lee*, *The Midshipmilit*, *Polly*, *They All Love Jack*, *Jack's Yarn*, *The Deathless Army*, *The Old Brigade*, *Darby and Joan*, *The Children's Home*, *The Old Maids of Lee*, *The Men of Ware*, *The Star of Bethlehem*, *The Holy City*, *The Last Watch*, *London Bridge*, *Blest Redeemer*, and two volumes of verse.

Weather-side denotes that side of a ship which is towards the wind.

Weather Signals. See **WEATHER FORECAST.**

Weaver, **JOHN** (1673–1760), English dancing master, was born at Shrewsbury. From 1702 he was closely connected with theatrical enterprises in London; and he introduced (1702) entertainments called 'scenical dancing,' where the representation and story were carried on by dancing action and motion only. His best-known pieces, produced at Drury Lane and elsewhere, included *The Tavern Bickers* (1702); *The Union* (performed at court on the Queen's birthday, 1707); *The Loves of Mars and Venus* and *Perseus and Andromeda* (1716); *Cupid and Bacchus* (1719); and *The Judgment of Paris* (1733). He also wrote *Lectures on Dancing* (1721), and an interesting work, *The History of the Mimes and Pantomimes* (1728).

Weaver-birds (Ploceidae), a family of finch-like passerine birds, most abundantly represented in Africa, but also found in south-eastern Asia and in the Australian region. The bill is strong and conical, and there are ten primary quills in the wing. The most notable peculiarity, however, is the nest, which is a large, rough mass of grass, typically retort-shaped, with a tubular entrance or spout, which is made by weaving the blades of grass in and out just as in weaving cloth. Both sexes take part in the weaving process. Some of the weavers nest in colonies: *Philetarus socius* constructs an enormous umbrella-shaped mass of grass in a tree, each pair having its own cavity beneath this roof which serves alike as a shelter and a nest. Weaver-birds are usually bright-coloured, and often used as cage birds. The diet consists chiefly of seeds, but insects are also taken. The more typical forms belong to the genus *Ploceus*, of which *P. baya* is the baya or weaver-bird of India and Ceylon, which constructs a flask-shaped nest. In Africa the members of the genus *Phantornis* are common, and *H. capensis* of S. Africa is often kept in captivity, when it

becomes very tame. Less typical are the whydah or widow birds and their allies, which form a special sub-family. The whydah birds (*Vidua*) are exclusively African, and are characterized by the fact that the males in breeding plumage have the four median tail feathers greatly elongated. The colouring is striking, being usually black, set off with some contrasting tint, such as white or orange yellow. The best-known species is *V. paradisaea*, a common cage-bird. This bird is stated to be very helpless in the full nuptial plumage. Related are the Munias, of which *M. oryzivora* is the well-known Java sparrow, often kept in captivity. Another African form is the wax-bill (*Estrelida astrilda*), a favourite cage-bird, with a bright-red bill, which has a translucent, waxy appearance.

Weaving. See **COTTON, WOOLLEN TEXTILES.**



Web (girder).

Web, the thin plate connecting the upper and lower flanges of an iron beam or girder. It is assumed that the web takes up the whole of the shearing stress. If the beam be horizontal, this produces in the web tensile and compressive stresses at angles of 45° with the horizon. The compressive stress tends to produce buckling in the web, and in calculation, strips of the web from flange to flange, along lines at 45° to the horizon, are taken as long columns fixed at the ends, their least diameter being the thickness of the web. The stability of these is investigated in the usual way—say by Gordon's formula—and, if necessary, stiffeners, *s*, *s*, are introduced, which both shorten the lengths of the columns and prevent side buckling. In an open girder the tension and compression stresses are taken up directly by sloping ties and struts of breadth sufficient to prevent side buckling. See **BRIDGE.**

Webb, **ASTON** (1849), English architect, born in London, has designed many notable buildings, among them the Britannia Royal Naval College, Dartmouth, the architectural surroundings for

the Victoria Memorial, and the French Protestant church, Soho; while with Mr. D. Ingress as a partner he supplied the designs for the Royal United Service Institution, the new Christ's Hospital, and Birmingham University.

Webb, **MATTHEW** (1848–83), known as Captain Webb, the Channel swimmer, was born at Dawley in Shropshire. He was in the mercantile marine until 1875, when he became a professional swimmer, making his first attempt, August 12, to swim the Channel, which ended in failure, but succeeding on the second attempt, August 24. To maintain a waning popularity, he undertook to swim the rapids and whirlpool of Niagara, and perished in the suicidal attempt.

Webb, **SIDNEY** (1859), English author, born in London, was a civil servant, but resigned his position on being elected to the London County Council (1891). Among his works are *Socialism in England* (1890); *The London Programme* (new ed. 1895); *Labour in the Longest Reign* (1897); with his wife, Beatrice Webb, *The History of Trade Unionism* (new ed. 1902); *Industrial Democracy* (new ed. 1902); *Problems of Modern Industry* (new ed. 1902); *The History of Liquor Licensing in England* (1903); and *London Education* (1904).

Webb City, city, Jasper co., Missouri, U.S.A., in a lead and zinc region, 64 m. W. of Springfield. Pop. (1900) 9,201.

Webbe, **WILLIAM** (fl. 1568–91), English critic of poetry; studied at St. John's College, Cambridge, where he became acquainted with Spenser and Gabriel Harvey; he afterward acted (1583–9) as tutor in the Grey family. In 1586 there appeared his *A Discourse of English Poetrie*, which shows him to have been intimately acquainted with contemporary English poets as well as poetry. As a critic he has great merit and soundness. His *Discourse* was reprinted in Professor Arber's series (1870).

Weber, **ERNST HEINRICH** (1795–1878), German physiologist, born at Wittenberg; was professor of physiology and anatomical science at Leipzig for sixty years (1818–78). His researches were specially directed towards determining the influence of the sensory nerves upon mental operations. 'Weber's Law' affirms that 'there will be the same sensible difference of intensity between two sensations, provided the relative intensities of the stimuli producing them remain the same.' His most notable book (in conjunction with his brother Wilhelm Eduard) was *Willenlehre* (1825).

Weber, GEORG (1808-88), German historian, born at Bergzabern in the Palatinate; became superintendent of the burgher school at Heidelberg (1848-72). His works include *Geschichte der Kirchenreformation in Grossbritannien* (ed. 1856); *Lehrbuch der Weltgeschichte* (21st ed. 1900); *Allgemeine Weltgeschichte* (15 vols. 2nd ed. 1882-90); and *Zur Geschichte des Reformationsseitzalters* (1874).

Weber, KARL MARIA FRIEDRICH ERNST VON (1786-1826), the founder of German romantic opera, and one of the most brilliant pianists of his day, was born at Eutin, near Lübeck. In 1803-4 he studied under the Abbé Vogler in Vienna, and in 1804-6 held the appointment of conductor of the theatre in Breslau. After leaving Breslau he became for some time musical director to Duke Eugene of Württemberg, and in 1807-10 acted as private secretary at Stuttgart to Duke Ludwig, brother to the king of Württemberg. He then determined to devote himself seriously to musical composition, but also found time to make frequent concert tours, a number of which were made in conjunction with Bärmann, the clarinetist, for whom he wrote three concertos. From 1813-16 he was director of the opera in Prague, and in 1817 became musical director of the German opera in Dresden, an appointment he held till his death. He died in London, whither he had gone to direct the production of *Oberon*, the opera commissioned by Charles Kemble. Weber's best known dramatic works are *Der Freischütz* (1820), *Euryanthe* (1823), *Oberon* (1826), and the music to the play of *Preziosa* (1820). His other productions comprise masses, cantatas, part-songs, and songs; symphonies, overtures, and other orchestral music; concertos and sonatas for piano, and for various stringed and wind instruments. The spirit of romanticism pervades all Weber's music, and his compositions did much to influence the subsequent development of modern piano technique, orchestration, and opera down to Wagner. See Dr. Spitta's article in *Grove's Dictionary of Music*; Sir Julius Benedict's *Weber*, in the *Great Musicians Series* (1881); Jähn's *Carl Maria von Weber* (1871); and A. Jullien's *C. M. Weber* (1894).

Weber, WILHELM EDUARD (1804-91), German physicist, younger brother of the above, was born at Wittenberg, and appointed professor of physics at Halle (1828), and at Göttingen (1831), but was deposed six years later for protesting against the political action of the Prussian

government. Thereafter he devoted himself to researches in acoustics, magnetism, elasticity, and electro-dynamics, mostly in association with Gauss. He published *Elektrodynamische Massbestimmungen* (7 parts, 1846-77), and, in conjunction with his brother Eduard Friedrich (1806-71), *Mechanik der Menschlichen Gewerkezeuge* (1836).

Webster, th., Worcester co., Massachusetts, U.S.A., 16 m. s.w. of Worcester; has manufactures of cotton and woollen goods. Pop. (1900) 8,804.

Webster, AUGUSTA (1837-94), English poetess, was born at Poole, Dorsetshire. In 1863 she became the wife of Thomas Webster, a fellow of Trinity College, Cambridge. She published *Dramatic Studies* (1866); *A Woman Sold, and other Poems* (1867); *Portraits* (1870); *Disguises* (1879); *A Book of Rhyme* (1881); the drama, *The Auspicious Day* (1872); and the tragedy, *The Sentence* (1887). She was also the author of excellent verse translations of *Prometheus Bound* (1866), and *Medea* (1868). With a sense of situation and form, Mrs. Webster, a creditable disciple of Browning's, sometimes constrained her rude vigour into a vivid realism, and in monologue (and occasionally in her lyrics) she reached excellence, if not brilliance. In her earlier career she used the pseudonym of Cecil Home. See Buxton Forman's *Our Living Poets* (1871), and Miles's *Poets and Poetry of the Century* (ed. 1905).

Webster, BENJAMIN NOTTINGHAM (1797-1882), English actor and play writer, was born in Bath, Somerset. He was essentially a 'character' actor, grim and serious rather than humorous being the parts which suited him—e.g. Rodin in *The Wandering Jew*, Jabez Sneed in *A Wife's Secret*, and Triplet in *Masks and Faces*. He was for many years manager of the Adelphi Theatre, London, and later of the Haymarket, and wrote more than a hundred plays and farces, of which many were adaptations from the French.

Webster, DANIEL (1782-1852), American lawyer and statesman, distinguished for his acumen and oratory, was born at Salisbury, New Hampshire, of Scottish blood. He was called to the bar at Boston in 1805, and in 1813 represented New Hampshire in Congress as a Federalist. In 1816 he went to Massachusetts, where he laid the foundation of his reputation by his conduct of the Dartmouth College case. His opinion and advocacy were from that day eagerly sought. His high reputation as an orator amongst a people prolific in

oratory was gained by a great speech at Plymouth, on the two hundredth anniversary of the landing of the Pilgrim Fathers. Henceforth, on every national occasion, Daniel Webster was brought to the front, although his efforts were for expediency. He desired peace above all things, and that the vested interests of the country should be respected. At one time he advocated 'unrestricted trade' against the protectionists. At another, his desire to prevent injury to the manufactures of his constituents prompted him to defend the tariff, or what was known as Clay's 'American system.' His greatest hit in the Senate was in 1827, when he attacked what was called 'nullification.' This was a Southern attempt to override Congress by allowing individual states to nullify or set aside any decree of the central government which they considered unconstitutional. Webster utterly confounded the promoters of this scheme. His *Speeches* were published in 6 vols. (1851). See *Lives* by G. T. Curtis (1869), and H. Cabot Lodge (1884).

Webster, JOHN (?1580-?1625), English dramatist, is one of the numerous Elizabethan playwrights of whose life we know next to nothing. In 1604 he made 'additions' to Marston's *Malcontent*. He collaborated with Dekker in the tragedy of *Sir Thomas Wyatt*, and the comedies, *Westward Ho!* and *Northward Ho!* (all published in 1607). His own unaided productions, on which his reputation as a dramatist rests, are four in number, namely, *The White Devil*, or *The Life and Death of Vittoria Corombona* (produced c. 1608-12), *Appius and Virginia* (produced c. 1609), *The Duchess of Malfi* (produced c. 1616), and the comedy, *The Devil's Law-case* (produced c. 1619). As a master of tragedy, and especially of the tragedy of terror and violence, he is ranked as second only to Shakespeare. It is not, however, on the strength of his plays as a whole, or of his consistent character portrayal, that this elevated position has been assigned to him, but in virtue of the extraordinary power of some of his individual scenes, and the wonderfully vivid psychological and poetical touches which are constantly to be met with in his masterpieces, *The White Devil* and *The Duchess of Malfi*. *The Thracian Wonder* and *A Cure for a Cuckold*, fathered on Webster and Rowley in 1664, are probably not his. In 1624 Webster composed a city pageant; and the John Webster, cloth worker, who died in 1625, has been conjecturally

identified with the poet. The chief editions of the works are those of Dyce (1830 and 1866), Hazlitt (1857-8), and a selection by J. A. Symonds in the *Mermaid Series* (1888). See also Hazlitt's *Lectures on the Literature of Elizabeth* (ed. 1901), Swinburne's essay in the *Nineteenth Century* of June 1886.

Webster, NOAH (1758-1843), American lexicographer, born at West Hartford, Connecticut; was admitted to the bar in 1781, and in 1782 opened a classical school at Goshen, New York. Returning to Hartford (1789), he practised law for some years, but afterwards became editor of the New York *Minerva* and *Herald*. He was one of the founders of Amherst College. He wrote *A Brief History of Epidemics* (1799), and other works; but his fame rests on his *Compendious Dictionary of the English Language* (1828). The latest edition (1902) was enlarged under the supervision of Noah Porter. See *Life* by H. Scudder (1882).

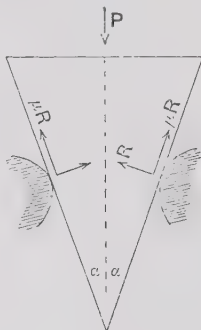
Webster, SIR RICHARD EVERARD. See ALVERSTONE, LORD.

Weckherlin, GEORG RUDOLF (1584-1653), German poet, born at Stuttgart; after acting as secretary to the Duke of Württemberg (1610-20), he went to England, and entered the service of James I. (1624), acting subsequently under Charles I. and Cromwell. He wrote epigrams, odes, sonnets, and rondeaux. A *Selection*, with biography, was published by Gödeke (1873).

Wedderburn, ALEXANDER, LORD LOUGHBOROUGH and EARL OF ROSSLYN (1733-1805), lord chancellor of England, was born in Edinburgh, but was called to the English bar (1757). In 1762 he became a member of the House of Commons, acting with the opposition, which, however, he deserted to become Lord North's solicitor-general in 1771. In 1780 he was created Baron Loughborough. In 1784 he joined Fox; but in 1793 he was made lord chancellor by Pitt, whom in turn he deserted. He was created Earl of Rosslyn by Addington in 1801.

Wedding Ceremonies. Formerly, a bridal was so named because of the warm, spiced 'bride-ale' which the wedding party drank on returning from church. In the north of England, the custom still survives of the young men competing in a race for the ribbon or handkerchief which the bride bestows upon the winner, who thereafter presents it to his sweetheart. But the companion gift of the 'bride-spurs' has fallen into disuse. Brides'-knots, otherwise wedding-favours, are still in use; and so, too, is the bride's-cake,

though it is no longer broken over the head of the bride, as was once the custom, the guests then making a scramble for the fragments. Nor is the drink, known as the 'bridal potion,' offered in these days to bride and bridegroom. Most, indeed, of the usages once followed are incompatible with the social ideas now current in civilized nations. The greatest variety of custom is found among the more primitive races. Burton states that in Somaliland the marriage ceremonies are conducted with feasting, music, and flogging—this last taking the shape of a sound horsewhipping administered by the bridegroom to the bride, 'with the view of taming any lurking propensity to shrewishness.' The marriage and divorce ceremonies of the gypsies are minutely described by Simson in his *History of the Gypsies* (1865). See also Wood's *The Wedding Day in all Ages and Countries* (1869), and Hutchinson's *Marriage Customs in Many Lands* (1897).



Wedge.

Wedge, one of the so-called simple mechanical powers. If assumed symmetrical with regard to the angle of the wedge, the reactions R being at right angles to the surfaces in contact, and $F = \mu R$ being the frictional forces opposing motion, the relation between the effort P and the reaction R is got by resolving vertically. Hence $P = 2R \sin \alpha + 2\mu R \cos \alpha$, μ being the co-efficient of friction. The wedge is used to separate obstacles by introducing its edge between them, and then thrusting the wedge forward by blows of a hammer.

Wedgwood, JOSIAH (1730-95), English potter, was born at Burslem, in Staffordshire, where in 1759 he set up in business for himself. From the first he made experiments in the direction of securing a better material and a better craftsmanship, and in both directions he succeeded so well that he may be said to have

created English pottery. He patented a cream-coloured porcelain, which from Queen Charlotte's appreciation of it became known as Queen's ware; and he induced the sculptor Flaxman to furnish him with classical designs for what is still known as Wedgwood ware—white cameo reliefs on a blue or biscuit-brown ground. See Church's *Wedgwoods* (1894).

Wedmore, vil., Somersetshire, England, 8 m. W.N.W. of Wells. The name is frequently used instead of Chippenham for the treaty (concluded in 878 between King Alfred and Guthrum the Dane) by which England N. of Watling Street was ceded to the Danes.

Wedmore, FREDERICK (1844), English art critic, born at Clifton. He has been art critic for the *Standard* since 1878; and among his works are *Studies in English Art* (1876-80), *Pastorals of France* (1877), *Meryon* (1879), *The Masters of Genre Painting* (1880), *Four Masters of Etching* (1883), *Life of Balzac* (1890), *Renunciations* (1893), *Etching in England* (1895), *Fine Prints* (1897), and *Constable and Lucas* (1904). He has also edited the English edition of Michel's *Rembrandt* (1894), and *Turner and Ruskin* (2 vols. 1900).

Wednesbury, munic. and parl. bor., Staffs, England, 8 m. N.W. by W. of Birmingham. Iron manufactures are important (rails, axles, boiler plates, edge tools, gunlocks). Pop. (1901) munic. bor. 26,544; parl. bor. 72,478.

Weeds are wild plants growing in cultivated ground. In fighting with weeds, garden flowers will be much assisted by deep cultivation, rich soil, and a provision of those general conditions which conduce to their health and vigour. As a rule, it is the perennial weeds with spreading roots which give the real trouble. Every piece of such root—couch-grass, bindweed, etc.—should be picked out and burnt. For weedy paths, all that is required is to water them when dry with a solution made by boiling five ounces of powdered arsenic in a gallon of water, stirring the while, and then adding two gallons of cold water and half a pound of soda. On farms the seeding of weeds may be prevented by mowing when the first flower buds appear. In general, the following principles apply:—(1.) The rootstocks may be dug up, and removed, a remedy that can be practically applied only in small areas. (2.) Salt, mineral oil, or strong acid applied so as to come in contact with the freshly-cut roots or rootstocks destroys them for some distance from the point of contact. Crude sulphuric acid is probably the most effective of comparatively inex-

pensive materials that can be used for this purpose, but its strong corrosive properties render it dangerous to handle. Carboic acid is less corrosive and nearly as effective. (3.) Rootstocks may be starved to death by preventing any development of green leaves or other parts above ground. This may be effected by persistent, thorough cultivation, by the use of the hoe or spud, and by salting the plants and turning on sheep in permanent pastures. (4.) The plants may usually be smothered by dense sod-forming grasses, or by a crop like clover or millet, that will exclude the light. (5.) Most rootstocks are readily destroyed by exposing them to the direct action of the sun during the summer drought, or to the direct action of the frost in winter. In this way ploughing becomes effective. (6.) Any cultivation which merely breaks up the rootstocks and leaves them in the ground, especially during wet weather, aids in their distribution and multiplication, and is worse than useless, unless the cultivation is continued so as to prevent any growth above ground. Spraying with a three per cent. solution of sulphate of copper, applied at the rate of 50 gallons per acre, has been found to kill charlock. Gas liquor, and a five per cent. solution of carbolic acid in water, were found effective by Dr. J. Voelcker in destroying wild garlic, red poppy, and other weeds; while applications of lime in the spring greatly reduced the amount of annual chrysanthemum. Spraying has found its strongest advocate in Mr. G. F. Strawson. The most striking experiments upon the influence of certain established manures, such as superphosphate, potash salts, and nitrogenous manures, in gradually causing the disappearance of weeds in pastures, are to be found in Tipper's *Rothamsted Experiments* (1897), and Hall's *Rothamsted Experiments* (1905).

Week. The period of seven days, now universally adopted over the Christian and Mohammedan worlds, is of Hebrew or Chaldean origin. It has been generally regarded as a memorial of the creation of the world, according to the Mosaic account, in that space of time. But it is, besides, the most obvious and convenient division of the lunar or natural month. Dion Cassius attributes the invention of the week to the Egyptians. The Ptolemaic arrangement of the heavenly bodies, according to their distances from the earth, is in this order—Saturn (the most distant), Jupiter, Mars, the Sun, Venus, Mercury, the Moon; and it was a principle of the ancient astrology that these

bodies presided in this succession over the hours of the day. If the first hour be assigned to Saturn, the twenty-fifth, or first hour of the second day, will fall to the sun; the forty-ninth, or first hour of the third day, to the moon; and so on. From the Latin designations of the planets have been formed the modern names—Saturday (Saturn), Sunday (Sol), Monday (Moon), Tuesday (Tiu, the Saxon Mars), Wednesday (Woden, or Mercury), Thursday (Thor, or Jupiter), and Friday (Frygga, or Venus). The week of seven days is not only a recognized space of time in the ancient Brahmanical astronomy, but the days are named in succession after the same heavenly bodies as among the Greeks and Romans. See CALENDAR.

Weem. See EARTH-HOUSE.

Weenen, vil., Natal, near Colenso and on the Tugela, notorious for the massacre here of Boer women and children by Dingaan, the Zulu king (1838). Pop. (1904) 1,619.

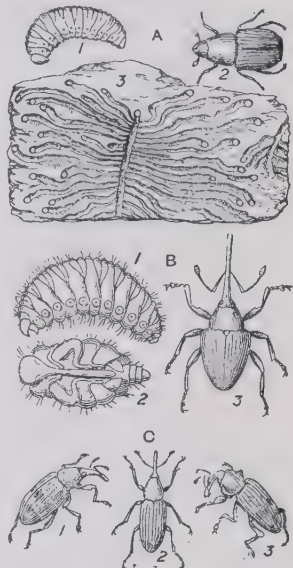
Weenix, JAN (1640–1719), Dutch painter, born at Amsterdam. His excellence as a painter of dead game secured him the patronage of Elector Palatine Johann Wilhelm, for whom he executed many commissions. He was also a painter of landscapes and portraits. The *Dead Swan* at the Hague may perhaps be considered his masterpiece.

Weeping, an emotional disturbance characterized by short, deep inspirations, long expirations with the glottis narrowed, relaxed facial and jaw muscles, copious secretion of tears which are secreted by the lachrymal glands, and often by plaintive, inarticulate expressions. It is usually the involuntary result of strong emotion or of pain, but is sometimes a symptom of hysteria, in which affection it frequently alternates with laughter.

Weeping Tree, a term applied to a tree the branches of which droop towards the ground. Notable examples are afforded by the weeping willow, elm, and birch. Most of these trees cannot be propagated by means of seeds, but are increased by means of grafting, the graft being applied to a young tree of the upright-growing form.

Weever, or STING-FISH (*Trachinus*), a genus of bony fishes the members of which are everywhere dreaded on account of the painful wounds inflicted by their poison-bearing dorsal and opercular spines. Two species are British—the greater weever (*T. draco*), which reaches a foot in length; and the lesser weever (*T. vipera*), which is only about six inches in length. Both are coast fishes.

Weever, JOHN (1576–1632), English poet, critic, and antiquary, was born in Lancashire. In 1599 he issued *Epigrammes in the Oldest Cut and Newest Fashion*, in which there is a sonnet addressed to Shakespeare. In 1601 appeared *The Mirror of Martyrs*, in which he vindicates the character of Sir John Oldcastle from the suggestion that he was the original of Falstaff in Shakespeare's then recent play *Henry IV.*; and from this poem the date of Shakespeare's *Julius Caesar* has been determined. Weever was an accomplished antiquarian, publishing (1631) *Ancient Funerall Monuments within the United Monarchie of Great Britaine and Ireland*.



Weevils.
A. *Scolytus destructor*: 1, larva; 2, imago; 3, borings in bark by larva. B. *Balaninus nucum*: 1, larva; 2, pupa; 3, imago. C. A group of common weevils: 1, apple-blossom weevil; 2, corn-weevil; 3, pine-weevil.

Weevil, a general name for the members of the family Curculionidae, or plant-eating beetles. Some twenty thousand species have already been described. The head is prolonged into a beak, which is very variable in length and thickness; and the antennae are elbowed, the first joint being long. The larvae are footless grubs; they are always vegetarian, and not infrequently cause great destruction. The adults usually do but little damage, but the pine-weevil (*Hyllobius abietis*) is an exception. The weevils of the genera Apoderus, Attelabus, and Rhynchites are interesting on account of the way in which

the females roll up leaves in order to form a shelter for the young. Several species of leaf-rolling weevils occur in Britain, *Rhynchites betule* being common on birch trees. The too familiar nut-weevil is the larva of *Balaninus nucum*, while *Sitones lineatum* is very destructive to pease. The nut-weevil lays her eggs in the young nut while it is still soft, and the grub remains until autumn within the shell, after which it bores a hole through and escapes. The species of *Anthonomus* are very destructive to the flower-buds of fruit-trees. Thus *A. pomorum* attacks apple-blossom, feeding on the stamens and pistil so that the bud dies; the grub then pupates and the adult escapes, the whole life-history being rapidly run through. Grain is attacked by various weevils, notably by *Sitophilus granarius*, the corn-weevil, and *S. oryzae*, the rice-weevil. To the same sub-family belongs the large tropical palm-weevil (*Rhynchophorus palmarum*), whose fleshy grubs are sometimes eaten. Other important forms are *Apion apicans*, feeding on clover and other leguminous plants; species of *Bruchus*, which attack pease and beans; and *Scolytus destructor*, which belongs to a family closely allied to the weevils, whose members attack wood and bark.

Weighing-machine. See BALANCE.

Weights and Measures. All measurements consist of finding how often an unknown quantity contains some known quantity of the same kind. The abstract quantity, in terms of which the measurement is expressed, is called a 'unit,' while a 'standard' is its concrete representation. For example, the British unit of length is the yard, and the standard yard is the distance, at 62° F., between two plugs of gold sunk in a bar of platinum. This bar is preserved in London, while a number of more or less accurate copies are kept elsewhere. The French standard is similarly preserved in Paris, its length, at 0° C., defining the metre. Units are of two kinds—simple or derived. The yard, for instance, is a simple unit; and the square yard, being obtained from the first, is called a derived standard. The statement of how a derived unit involves the simple units is called its dimensions. Up till comparatively recent times common objects served as standards—the digit, the foot, the cubit, etc. Indeed in 1101 Henry I. commanded that the length of his arm should define the yard; while in 1266 it was enacted 'that an English penny called a sterling, round and without clipping, shall weigh thirty-two wheat

corns, from the midst of the ear.' The British units now in use are: the yard, as unit of length; the pound troy, as unit of weight; the gallon, as unit of capacity. The first of these may be determined from the length of the seconds pendulum, which in the latitude of London is 39.13929 in; the second from a cubic inch of distilled water, which weighs 252.458 grains. The third is the space occupied by 10 lbs. avoirdupois (i.e. 7,000 grains troy) of distilled water. In the above operations the temperature is to be 62° F., and the barometer to stand at 30 in.

BRITISH SYSTEMS.

MONEY.

4 farthings = 1 penny (1d.).
12 pence = 1 shilling (1s.).
20 shillings (240d.) = 1 pound (£1).

(The value of the old Scots money was one-twelfth that of the sterling value—bodle = $\frac{1}{12}$ d., plack = $\frac{1}{24}$ d., shilling = 1d., pound = 1s. 8d.)

The standard for gold coins is 22 carats—i.e. any weight of standard gold should contain 22 parts of pure gold and 2 parts of alloy. The standard for silver coins is 11 oz. 2 dwt. of pure metal and 18 dwt. of alloy, making together 12 oz. or 1 lb. troy. It is useful to remember that the diameter of the $\frac{1}{2}$ d. is 1 in.; and that three pence, five half-pence, ten farthings, five shillings, or ten sixpences, weigh 1 oz.

MEASURES OF LENGTH.

Common Linear Measure.

12 inches = 1 foot.
3 feet = 1 yard.
 $5\frac{1}{2}$ yards = 1 pole, rod, or perch.
40 poles = 1 furlong.
8 furlongs = 1 mile.
1,760 yards = 1 mile.

The hand in terms of which horses are measured = 4 in. Gunter's chain of 66 ft. contains 100 links of 7.92 in. The military pace is 2.5 ft. The fathom of 6 ft. is used to record soundings. One cable's length = 120 fathoms, 240 yds. One Admiralty knot = 6,080 ft. One geographical mile = 6,082.66 ft.; one nautical mile = 1,870 yds. The earth's circumference is divided into 360 degrees of 69 $\frac{1}{2}$ m. each.

MEASURES OF SURFACE.

144 square inches = 1 square foot.
9 square feet = 1 square yard.
30 $\frac{1}{2}$ square yards = 1 square pole.
40 square poles = 1 rood.
4 roods = 1 acre.
640 acres = 1 square mile.

The square chain being a tenth part of an acre, square links may readily be expressed in terms of acres, roods, and poles.

MEASURES OF CAPACITY.

1. Solid or Cubic Measure.

1,728 cubic inches = 1 cubic foot.
27 cubic feet = 1 cubic yard.

Forty cub. ft. of hard wood and 50 cub. ft. of other wood = 1 ton or load; 42 cub. ft. of wood = 1 shipping ton; 108 cub. ft. of wood = 1 stack of wood; 128 cub. ft. of wood = 1 cord of wood; 40 cub. ft. of merchandise = 1 shipping ton.

2. Measure of Capacity.

8 pints = 1 gallon.
2 gallons = 1 peck.
4 pecks = 1 bushel.
8 bushels = 1 quarter.

Ten quarters = 2 weys = 1 last.
One gallon = 10 lbs. distilled water. United States bushel = 3688 bushel. Thirty-six bushels = 1 chaldron. The boll of meal = 140 lbs.

3. Wine Measure.

2 pints = 1 quart.
4 quarts = 1 gallon.
42 gallons = 1 tierce.
 $1\frac{1}{2}$ tierces = 1 hogshead.
 $1\frac{1}{2}$ hogsheads . . . = 1 puncheon.
 $1\frac{1}{2}$ puncheons . . . = 1 pipe.
2 pipes = 1 tun.

4. Ale and Beer Measure.

4 gills = 1 pint.
2 pints = 1 quart.
4 quarts = 1 gallon.
9 gallons = 1 firkin.
2 firkins = 1 kilderkin.
2 kilderkins . . . = 1 barrel.
 $1\frac{1}{2}$ barrels = 1 hogshead.
 $1\frac{1}{2}$ hogsheads . . . = 1 puncheon.
 $1\frac{1}{2}$ puncheons . . . = 1 butt.

Of imported wines the following are the chief measurements: pipe of port = 115 gals.; pipe of Marsala = 93 gals.; pipe of Madeira = 92 gals.; butt of sherry = 108 gals.; aum of hock and Rhenish = 30 gals.; hogshead of claret = 46 gals. Imported spirits, brandy, and rum: puncheon = 112 gals.; hogshead = 56 gals.; quarter cask = 28 gals.

WEIGHTS.

1. Avoirdupois Weight.

16 drachms = 1 ounce.
16 ounces = 1 pound.
28 pounds = 1 quarter.
4 quarters = 1 hundredweight
20 cwt. . . . = 1 ton. [cwt.
100 lbs. = 1 cental.

2. Troy Weight.

24 grains . . . = 1 pennyweight.
20 pennyweight = 1 ounce.
7,000 grains troy = 1 lb. avoird.
5,760 grains = 1 lb. troy.

3. Apothecaries' Weight (prior to 1864).

20 grains or minims = 1 scruple.
3 scruples . . . = 1 drachm.
8 drachms . . . = 1 ounce.
12 ounces . . . = 1 pound.

(Introduced in 1864.)

437 $\frac{1}{2}$ grains . . . = 1 ounce.
16 ounces . . . = 1 lb.

4. Apothecaries' Fluid Measure.

60 minims. = 1 drachm (3 i).
 8 drachms = 1 ounce (3 i).
 20 ounces = 1 pint (O i).
 8 pints. = 1 gallon (C i).

Some useful approximations:—
 A drop = 1 minim; a teaspoon-
 ful = 1 drachm; a dessert-spoon-
 ful = 2 drachms; a tablespoon-
 ful = 4 drachms; a wineglassful
 = 2 ounces; a teacupful = 6
 ounces; a tumblerful = 8 ounces.

5. Diamond and Pearl Weight.

3'16831 grains = 1 carat, 3'2 grs.
 troy.
 151½ carats = 1 ounce troy.

6. Jewel Weight.

240 grains (gold or silver) = 1 carat.
 24 carats = 1 pound.

MEASURES OF TIME.

There are two systems in terms of which time is measured—the one for scientific, the other for practical purposes. In the former the sidereal day is the unit. It is the interval between two successive returns of the 'first point of Aries' to the meridian. This period is divided into twenty-four hours. In the latter the solar day is the unit, it being the interval between two successive returns to the meridian of an imaginary 'mean' sun moving on the equator with uniform velocity. Twenty-four hours mean solar time are equal to 24 hrs. 3 min. 56'554 sec. of sidereal time.

The divisions of the solar day are:—

60 seconds (sec.) = 1 minute.
 60 minutes = 1 hour.
 24 hours = 1 day.

The day commencing at mid-night.

The solar year contains 365'24219 days. See CALENDAR.

MEASURES OF ANGLES.

The magnitude of an angle may be expressed in circular, centesimal, or sexagesimal measures. The first is used in scientific work, the last in practical. The radian, the unit of circular measure, is the angle subtended at the centre of a circle by an arc equal to the radius. Conversions from degrees to radians, and *vice versa*, are given by the equation $\theta^\circ = \frac{\theta}{2\pi}$, θ being the angle in 360° = 2 π , θ being the angle in radians, θ° in degrees.

The divisions of the right angle are:—

60 seconds (60'') = 1 minute (1').
 60 minutes = 1 degree (1°).
 90 degrees = 1 right angle.

The radian is equal to 57'29577, etc., degrees. The centesimal method of dividing the right angle into grades, minutes, and seconds is sometimes used.

SPECIAL WEIGHTS AND MEASURES.

Bag of coffee	112 to 180 lbs.
Bag of cocoa or sago	112 lbs.
Bag of sugar	224 lbs.
Bale of cotton, American	400 to 500 lbs.
Bale of cotton, Egyptian	700 to 740 lbs.
Bale of cotton, Indian	500 to 600 lbs.
Bar of gold (mint)	400 oz. troy.
Bar of silver (mint)	1,000 to 1,100 oz. troy.
Barrel of beef	200 lbs.
Barrel of butter	106 and 256 lbs.
Barrel of flour	196 and 228 lbs.
Barrel of gunpowder	100 lbs.
Barrel of raisins	112 lbs.
Barrel of soft soap	256 lbs.
Bolt of canvas	35 yds.
Bushel of barley	47 lbs.
Bushel of oats	38 lbs.
Bushel of wheat	60 lbs.
Cade of herrings	500 fish.
Chest of tea	80 to 84 lbs.
Cran of herrings	37½ gals.
Dicker of gloves	10 doz. pair.
Dicker of hides	10 skins.
Firkin of butter	56 lbs.
Firkin of soap	64 lbs.
Hank of silk	840 yds.
Hogshead of tobacco	12 to 18 cwt.
Last of fish (cod)	12 barrels.
Last of hides	12 doz.
Last of leather	200 skins.
Last of pitch or tar	14 barrels.
Last of wool	12 sacks.

(The last weighs about 4,000 lbs.)

Load of bricks	500 lbs.
Load of earth or gravel	A cubic yard.
Load of hay or straw	36 trusses.
Load of lime	32 bushels.
Maze of herring	615 fish.
Pack of wool or flax	240 or 480 lbs.
Peck of flour	14 lbs.
Pig of ballast	56 lbs.
Pocket of hops	168 to 224 lbs.
Roll of parchment	60 skins.
Sack of flour	280 lbs.
Sack of wool	364 lbs.
Seam of glass	120 lbs.
Truss of hay (new)	60 lbs.
Truss of hay (old)	56 lbs.
Truss of straw	36 lbs.
Yard of butter	1 lb.

PAPER MEASURE.

24 sheets	= 1 quire.
25 sheets	= 1 quire (printer's).
20 quires (480 sheets) = 1 ream.	
21½ quires (516 sheets) = 1 ream (printer's).	
2 reams	= 1 bundle.
10 reams	= 1 bale.

METRIC SYSTEM.

See article under this title.

MEASUREMENT OF PHYSICAL QUANTITIES.

All physical quantities, such as force and velocity, can be expressed in terms of the length, mass, and time units.

C.G.S. SYSTEM.

In this the units are derived from the *centimetre*, fundamental unit of length; the *gram*, fundamental unit of mass; the *second*, fundamental unit of time. The units, being independent of any arbitrary quantities beyond

the fundamental ones, are frequently said to be 'absolute.' The above is, however, the more appropriate name, since by taking the foot, pound, and second, another set of absolute units might be derived. Electric measurements are founded on the C.G.S. system. See UNITS.

WEIGHTS AND MEASURES OF OTHER COUNTRIES.

The metric system has been adopted by Austria, Belgium, Brazil, Bulgaria, the Central American states, Chile, Egypt, France, Germany, Greece, Italy, Mexico, Norway, Peru, Roumania, Servia, Spain, Sweden, Switzerland, Turkey, Venezuela, and other countries. In Austria the names used under the metric system are the same as in Germany. In Belgium the system is used with the French names, excepting that the kilogram is called the *livre*, the *litre* is

called the litron, and the metre the aune. In Germany the metric system is used, but with German names—stab for metre, stuch for centimetre, kette for decametre, kanne for litre, schoppen for half-litre, fass for hectolitre, nealoth for decagram. Centner = 50 kilograms. Tonne = 1,000 kilograms. In Greece, pecheus is used for metre, gramine

centimetro for centimetre, millimetro for millimetre, ara for are, ettara for hectare, centiara for centiare, litro for litre, decalitra for decalitre, ettolitra for hectolitre, chilolitra for kilolitre, decilitra for decilitre, gramma for gram, decagramma for decagram, miriagramma for myriagram, decigramma for decigram, centigramma for centi-

In Spain the French metric names are formed by transforming the last letter into o—e.g. metro, litro, gramo.

In Turkey, metro becomes arshin, kilometre is nal, decalitre is shinik, hectolitre is kileh, are is evlek, hectare is djeril, kilogram is oke—batman meaning ten kilograms, cantar a hundred kilograms, and tcheki a thousand

FOREIGN MONEYS.

Countries.	Monetary Unit.	Value in British Money.	Coins.
Argentina.....	Peso.	£ s. d. 0 4 0	Gold—argentine (19s. 10d.) and $\frac{1}{2}$ argentine; silver—peso and divisions.
Austria-Hungary.....	Crown.	0 0 10 $\frac{1}{2}$	Gold—20 crowns (16s. 8d.) and 10 crowns.
Belgium.....	Franc.	0 0 9	Gold 10 and 20 francs; silver—5 francs.
Brazil.....	Milreis.	0 2 3	Gold—5, 10, and 20 milreis; silver— $\frac{1}{2}$, 1, and 2 milreis.
British N. America (except Newfoundland).....	Dollar.	0 4 1 $\frac{1}{2}$	
British Honduras.....	Do.	0 4 1 $\frac{1}{2}$	
Chile.....	Peso.	0 3 9	Gold—escudo (7s. 6d.), doubloon (15s.), and condor (30s.); silver—peso and divisions.
Colombia.....	Dollar.	0 4 1 $\frac{1}{2}$	Gold—condor (40s.) and double condor; silver—peso.
Costa Rica.....	Colon.	0 1 11	Gold—2, 5, 10, and 20 colons (38s. 5d.); silver—5, 10, 25, and 50 centimos.
Cuba.....	Peso.	0 3 9	Gold—doubloon (20s. 8d.); silver—peso (2s. 6d.).
Denmark.....	Crown.	0 1 1 $\frac{1}{2}$	Gold—10 and 20 crowns.
Ecuador.....	Sucre.	0 2 1	Gold—10 sucres; silver—sucre and divisions.
Egypt.....	Pound (100 piastres).	1 0 3 $\frac{1}{2}$	Gold—10, 20, 50, and 100 piasters; silver, 1, 2, 10, and 20 piasters.
Finland.....	Mark.	0 0 9 $\frac{1}{2}$	Gold—10 and 20 marks.
France.....	Franc.	0 0 9 $\frac{1}{2}$	Gold—5, 10, 20, 50, and 100 francs; silver—5 francs.
Germany.....	Mark.	0 0 11 $\frac{1}{2}$	Gold—5, 10, and 20 marks.
Greece.....	Drachma.	0 0 9 $\frac{1}{2}$	Gold—5, 10, 20, 50, and 100 drachmas; silver—5 drachmas.
Haiti.....	Gourde.	0 4 0	Silver—gourde.
India.....	Pound sterling <i>a</i> .	1 0 0	Gold—sovereign (pound sterling); silver—rupee (15 to the sovereign) and divisions.
Italy.....	Lira.	0 0 9 $\frac{1}{2}$	Gold—5, 10, 20, 50, and 100 lire; silver—5 lire.
Japan.....	Yen.	0 2 1	Gold—1, 2, 5, 10, and 20 yen.
Liberia.....	Dollar.	0 4 1 $\frac{1}{2}$	
Mexico.....	Peso.	0 2 1	Gold—5 and 10 pesos; silver—peso and divisions.
Netherlands.....	Florin.	0 1 8	Gold—10 florins; silver, $\frac{1}{2}$, 1, and 2 $\frac{1}{2}$ florins.
Newfoundland.....	Dollar.	0 4 2	Gold—\$2 (\$2.02 $\frac{1}{2}$).
Norway.....	Crown.	0 1 1 $\frac{1}{2}$	Gold—10 and 20 crowns.
Panama.....	Balboa.	0 4 1 $\frac{1}{2}$	Gold—1, 2 $\frac{1}{2}$, 5, 10, and 20 balboas; silver—peso and divisions.
Peru.....	Libra.	1 0 0	Gold—libra (20s.); silver—sol and divisions.
Philippine Islands.....	Peso.	0 2 1	Silver—peso, 50, 20, and 10 centavos.
Portugal.....	Milreis.	0 4 5	Gold—1, 2, 5, and 10 milreis.
Russia.....	Rouble.	0 2 1 $\frac{1}{2}$	Gold—imperial (\$7.718) and $\frac{1}{2}$ imperial (\$3.859); silver— $\frac{1}{2}$, $\frac{1}{4}$, and 1 rouble.
Spain.....	Peseta.	0 0 9 $\frac{1}{2}$	Gold—25 pesetas; silver—5 pesetas.
Sweden.....	Crown.	0 1 1 $\frac{1}{2}$	Gold—10 and 20 crowns.
Switzerland.....	Franc.	0 0 9 $\frac{1}{2}$	Gold, 5, 10, 20, 50, and 100 francs; silver—5 francs.
Turkey.....	Piaster.	0 0 2 $\frac{1}{2}$	Gold—25, 50, 100, 200, and 500 piasters.
Uruguay.....	Peso.	0 4 3	Gold—peso; silver—peso and divisions.
Venezuela.....	Bolivar.	0 0 9 $\frac{1}{2}$	Gold—5, 10, 20, 50, and 100 bolivars; silver—5 bolivars.

The currency fluctuates with the price of silver in Bolivia (boliviano, about 1s. 10d.), Central America (peso, about 1s. 10d.), China (tael, about 2s. 11d.; British dollar, or 'Mexican dollar,' about 2s.), and Persia (kran, about 4d.).

for millimetre, daktylos for centimetre, skionis for myriametre, stremma for are, litra for litre, kybos for millilitre, mystron for decilitre, koiion for hectolitre, drachma for gram, kokkos for centigram, and obolos for decigram. The Italian metric names are metro for metre, decametro for decametre, ettometro for hectometre, chilometro for kilometre, miriametro for miriametre, decimetro for decimetre,

gram, and milligramma for milligram.

In the Netherlands metric system el is used for metre, streep for millimetre, duim for centimetre, palm for decimetre, roede for decametre, mijle for kilometre, kan for litre, vingerhoed for centilitre, maatje for decilitre, vat for hectolitre, wigkje for gram, korrel for decigram, lood for decagram, onze for hectogram, and pond for kilogram.

kilograms. See METRIC SYSTEM, and *supra*.

Burma.—The weights and measures are those of British India.

Canada.—The use of the metric system is legal, but British weights and measures are in extensive use.

China.—Tee (69 m.) = 250 li = 250 × 5 fun; yan (1,410 in. or 117 $\frac{1}{2}$ ft.) = 10 cheung = 10² chek = 10³ tsun = 10⁴ fun; king (16'485

ac.) = 10^2 mau. Picul or tan (133'333 lbs.) = 10^2 catties = $10^2 \times 16$ tael. Tau (11 gal.) = 10 shing = 10^2 koh. At Hong-kong British weights and measures are also used.

Ceylon.—The measures of length and surface are the British imperial measures. The measures of capacity are the amomam of 8 parabs, equal to 448 imperial gallons. The parah consists of 2 mercials, and a mercial of 12 seers, the seer being equal to $\frac{1}{86}$ of a British imperial pint. A garce = 25 amomams.

India.—The weights vary in value. Bengal—Kilogramme and litre introduced, but old measures are still employed. Jojun (8,000 yds.) = 4 coss; guz (1 yd.) = 2 hath = 2×6 moot = 12×4 ungulee. Maund (bazaar) = 82'137 lbs.; factory = 74'667 lbs.) = 40 seers = 40×16 chittacks. Bombay—Guz (27 in.) = 24 tussoo; beegah (3,927 yds.) = 20 pund. Candy (558 lbs.) = 20 maunds = 20×4 seers = 80×72 tanks. Madras—Cawnic (1'322 ac.) = 24 mannee; maund (24'686 lbs.) = 8 viss = 8×40 pollums = 320×3 tolas; mercial (3 gals.) = 8 puddees.

Japan.—Measure—ken (6 shaku or 60 sun) = 6 ft.; cho (60 ken) = 119'3 yds.; ri = 2½ m.; square cho = 2½ ac. Weight—kin = 160 momme = ½ lbs.; tan (100 kin) = 133½ lbs. Capacity—To (10 sho) = 3'703 gals.; koku (10 to) = 4'96 bushels.

Malta.—The British imperial weights and measures are the only legal weights and measures in use in Malta.

Persia.—Measures of length—zer or guz is the chief unit, varying in length from 25 to a little over 44 British imperial in., its normal length supposed to be about 36'465 in., but often reckoned at 40. The measures of capacity are the chenica, about 2'3 pints; the collothun, about 1'8 gals.; the capicha, 2 chenica; and the artata, 8 collothun. The weights are—miscal, 71 grains; abassi, 8 miscals; seer, 16 miscals.

Russia.—Measures of length—8 vershoks = 1 stopa (14 inches); 2 stopas = 1 arschine; 3 arschines = 1 sashine; 500 sashines = 1 verst (5½ furlongs). Measures of surface—9 sq. arschines = 1 sq. sashine (784 sq. in.); 2,400 sq. sashines = 1 desatine (13,066½ sq. yds.). The desatine is equal to 2 ac. 2 roods. Weights—2 zolotnicks = 1 lotti (8 dwt. 5½ grs. troy); 8 zolotnicks = 1 lana (½ oz. avoiz.); 96 zolotnicks = 1 funt (14½ oz. avoiz.); 40 funts = 1 pood (1 qr. 3½ lbs.); 10 poods = 1 berkovitz (3 cwt. 0 qrs. 25½ lbs.); and 3 berkovitz = 1 packen (9 cwt. 2 qrs. 19½ lbs.).

Siam.—Kub = 10 in.; sok = 20 in.; wa = 80 in.; roeneng = 2,000 wa (about 2½ British miles).

Thonon = about 1½ imperial pints; thong = 3'75 gals.; coyan = 3'75 gals. Bat or tical = 234'06 grains; tael = 4 ticals; chang = 20 taels (2'675 of British imperial pounds); pical = 50 chang (133'75 British imperial pounds).

United States.—Weights and measures as in Great Britain, but the old Winchester measures are used, which are as follows:—Dry—pint = '969 pint; gallon = '969 gal.; bushel = '969 bush.; quarter = '969 qr. Liquid—pint (beer) = 1'017 pint; pint (wine and spirit) = '833 pint; gallon (wine and spirit) = '833 gal.

See Buchanan's *Tables of Weights and Measures* (1838); J. Brandis's *Das Münz-, Mass- und Gewichts-wesen* (1866); H. W. Chisholm's *Weighing and Measuring* (1873), and *Report on the Exchequer Standards* (1877); H. Dourether's *Dictionnaire Universel des Poids et Mesures, Anciens et Modernes*; Captain Kater's 'Construction and Adjustment,' in *Phil. Trans.* (1826), 30 and 31; Kelly's *Metrology* (1816) and *Universal Cambist* (ed. 1835); J. H. Norman's *The Universal Cambist* (1897); Browne's *Money, Weights, and Measures of all Nations* (8th ed. 1899); M. S. Soutzo's *Etalons Ponderaux Primitifs* (1884).

Law of Weights and Measures.—The previous law was consolidated by the Weights and Measures Act of 1878, amended by the Acts of 1889, 1892, 1893, and 1897. The administration of the law is vested, in counties and in boroughs which have not a separate court of quarter sessions and have not elected to administer the act, in county councils; in the larger boroughs, in town councils; in London, except in the City of London, in the county council; and the inspectors of these bodies verify the accuracy of weights and measures used in trade. The use in trade of unauthorized or unjust weights is punishable by a fine of £5, and £10 for a second offence (£20 in case of unjust weights). Under the Act of 1897 metric Board of Trade standards have been legalized. Bread must be sold by weight, except French or fancy bread or rolls. Coal must be sold by weight, except when by written consent of the purchaser it is sold by boat-load, or by wagons or tubs.

Wei-hai-wei, British naval and coaling station, on N.E. coast of Shang-tung peninsula, China, 40 m. E. of Chifu; commands the s. entrance to the Gulf of Pe-chi-li. Besides the harbour and the island of Liukung-tao forming it, the British leased a strip of land 10 m. wide round the bay, and covering an area of 285 sq. m. Its excellent climate makes it a summer resort for Europeans.

Pop. 150,000. After the battle of Hai-yun-tau the effective part of the Chinese fleet proceeded to Wei-hai-wei. On Feb. 9, 1895, the Japanese captured the town, and entirely destroyed the Chinese fleet.

Weil, GUSTAV (1808-89), German Orientalist, born of Jewish parents at Sulzburg; was appointed librarian at Heidelberg (1838-61), and professor of Oriental languages in that university (1861-89). Among his works are *Biblische Legenden der Muselmänner* (1845; Eng. trans. 1846); *Geschichte der Chalifen* (1846-51); *Mohammed der Prophet* (1843); and *Die Poetische Litteratur der Araber* (1837).

Weimar, tn., cap. of grand-duchy of Saxe-Weimar, Germany, 14 m. E. of Erfurt; is a seat of the book trade, and has manufactures of cloth and leather. In the 18th and 19th centuries it was a great literary centre, having associated with it Goethe, Schiller, Herder, Wieland, Immermann, and others. Among the numerous buildings are the ducal palace, the 15th-century town church, containing Cranach's *Crucifixion*, and the Liszt Museum. Pop. (1900), 28,489.

Weinberge, or KÖNIGLICHE WEINBERGE, tn., Austria, Bohemia, an eastern suburb of Prague. Pop. (1900) 52,483.

Weipert, tn., Austria, Bohemia, on Erzgebirge, at alt. of 2,380 ft., 20 m. W. of Komotau; manufactures laces and haberdashery. Pop. (1900) 10,037.

Weir. See RESERVOIRS.

Weir, HARRISON WILLIAM (1824-1906), English artist, author, and journalist, was born at Lewes. He became an expert animal painter and draughtsman, his first picture being *The Dead Shot*, exhibited at the British Institution (1843). Among his best works are *Startled, The Forester, A Servant of All Work, and The Christmas Carol*. He illustrated over 130 books, including *Routledge's Natural History*. He also originated the first cat show at the Crystal Palace, and wrote and illustrated *Our Cats and all about Them* (1889), as well as *Poultry and all about Them*.

Weir-Mitchell Treatment. In the treatment inaugurated by Dr. Weir Mitchell the chief feature is rest, with forced feeding. The patient should be kept in bed, and should be isolated from friends. In place of exercise is substituted massage, which stimulates the circulation and increases the appetite without producing exhaustion. Of the many disorders which are benefited by this treatment neurasthenia and hysteria perhaps occupy the front rank.

Weishaupt, ADAM (1748-1830), born at Ingolstadt, where he was

made (1772-85) professor of natural and canon law with the aid of the Jesuits, whose pronounced enemy he afterwards became. He founded the Illuminati, admitting into the order men of every creed; but the order was interdicted by the Bavarian government (1785). He wrote a number of philosophical works.

Weismann, August (1834), German biologist, born at Frankfurt-on-Main; was (1861-2) physician to the Archduke Stephen of Austria; studied zoology under Leuckart at Giessen; in 1866 was appointed professor of zoology at Freiburg. His early researches were devoted to pure zoology; but the partial failure of his eyesight forced him to give up microscopic work, and he turned his attention to problems of evolution. Weismann's theory of the continuity of the germ-plasm, which is discussed under HEREDITY and EMBRYOLOGY, is tantamount to a statement of an entire scepticism in regard to the inheritance of acquired characters. Weismann has been greatly concerned with the problem of the cause of variation. It is here that his position has undergone most marked change from time to time; but his latest position, that the germ-plasm is stimulated to change by the condition of nutrition to which it is exposed within the body, is not perhaps a great advance on the statement that as a matter of experience we find that organisms do tend to vary, whatever the effective cause of the variation. Weismann's more important works have been translated into English—e.g. *Studies in the Theory of Descent* (1882), *Essays upon Heredity* (1889-92), *The Germ-plasm* (1893), and *The Evolution Theory* (1904).

Weiss, BERNHARD (1827), German theologian, born at Königsberg. He was professor of theology at Kiel in 1857, and at Berlin in 1877. His *Lehrbuch der Biblischen Theologie des Neuen Testaments* (1868) has passed through five editions, and has been translated into English (1882-3); also his *Lehrbuch der Einleitung in das Neue Testament* (1887; Eng. trans. 1887-8), and *Das Leben Jesu* (1882; Eng. trans. 3 vols. 1883-4). He contributed largely to Meyer's *Kritisch-exegetischer Kommentar über das Neue Testament* (1883-8).

Weissenburg (Fr. *Wissembourg*), tn., Alsace-Lorraine, Germany, 33 m. N.N.E. of Strassburg; has manufactures of leather, paper, and matches. On Aug. 4, 1870, the Germans, under the Crown Prince of Prussia, defeated the French here. Pop. (1900) 6,946.

Weissenfels, tn., prov. Saxony, Prussia, on the Saale, 20 m. S. of Halle; has manufactures of

boots and paper. Coal is mined. Pop. (1900) 28,201.

Weisshorn. This wonderfully symmetrical pyramidal peak (14,804 ft.) is by many considered the most magnificent of the Alps. It rises W. of the Zermatt valley, and was first conquered in 1861 by Professor Tyndall.

Weitbrecht, GOTTLIEB FRIEDRICH (1840), German theologian, born at Kalw; devoted himself to teaching till his appointment as a clergyman in Stuttgart. His principal works are *Leben Jesu* (3rd ed. 1896), simple and direct, and popular theological and edifying treatises.

Weizsäcker, JULIUS (1828-89), German historian, was born at Oehringen. He was professor at Erlangen (1864), at Tübingen (1867), Strassburg (1872), Göttingen (1876), and Berlin (1881). He was editor of the *Deutsche Reichstagsakten* (1867-77).

Weizsäcker, KARL (1822-99), German theologian, brother of the above, also born at Oehringen, near Heilbronn. He succeeded Baur as professor of theology at Tübingen in 1861, and became known as editor of the *Jahrbücher für Deutsche Theologie* (1856-78), and by his *Untersuchungen über die Evangelische Geschichte* (1864) and *Das apostolische Zeitalter* (1886; Eng. trans. 1894).

Wekerle, ALEXANDER (1844), Hungarian statesman, was born in the co. of Stuhlweissenburg. He was for a while professor of financial science at the University of Budapest. In 1889 he was appointed minister of finance. In 1892 he succeeded Count Szapary as premier, and in 1894 was successful in passing the Civil Marriage Bill. He was, however, defeated by the Clericals in 1895, and retired. In 1897 he was made president of the Hungarian Court of Administration.

Welbeck Abbey, seat of Duke of Portland, Notts, England, 4 m. S.W. of Worksop. The 17th-century mansion incorporates portions of an abbey founded in the time of Henry II.

Welch, or **WELSH, JOHN** (?1570-1622), Scottish reformer and divine, was born in Dumfriesshire, and was appointed minister at Selkirk (1590), Kirkcudbright (1594), and visitor for Annandale (1596). In 1596 he publicly preached against the king and the council, and was denounced as a rebel, but was permitted to return to his charge (1597). For attending a prohibited assembly at Aberdeen he was convicted of high treason and sentenced to exile (1606). He resided in France till 1621, when he was allowed to return to Scotland.

Welcker, FRIEDRICH GOTTLIEB (1784-1858), German classical scholar, born at Grünberg in

Hesse-Darmstadt; was private tutor in the house of W. von Humboldt in Rome (1808), and became professor of archæology (1809) at Giessen, at Göttingen (1816), and at Bonn (1819). Among other works he wrote *Die Aeschyleische Trilogie* (1824-6); *Der Epische Cyklus oder die Homerischen Gedichte* (1835-49); *Griechische Götterlehre* (1857-63); and *Die Griechischen Tragödien* (1839-41). See Kekule's *Life*, in German (1880).

Weld. See WOOL. D.

Welding, the process of uniting materials by pressing or hammering them together when in a more or less plastic state. This plasticity is usually brought about by raising the temperature, as in the case of iron, platinum, or glass; but it may occur under the influence of pressure alone, as in the union of ice, or of metallic particles into a homogeneous mass.

Welding at a temperature short of the melting-point cannot be carried out with those metals that pass sharply from the solid to the liquid state. In the welding of iron, the parts to be united are heated in a forge to a temperature short of whiteness. A little sand or borax is sprinkled on the surfaces to be joined, to render the scale of oxide fluid, and the parts are then hammered together. Mild and tool steels are more difficult to weld, particularly if required to be united to wrought iron, as they must be worked at a lower temperature. Borax and sal-ammoniac are used as fluxes in welding steels. For electric welding, see ELECTROMETALLURGY.

Weldon, WALTER (1832-85), English chemist, was born at Loughborough, and in 1854 went up to London to journalism. Here in 1860 he commenced *Weldon's Register of Facts and Occurrences*. He had turned his attention to technological chemistry, the lime-manganese (1869) and the magnesia-chlorine (1870) processes being his invention.

Weldon Mud, the mixture of manganites of calcium and manganese obtained in Weldon's process for recovering manganese dioxide from the waste acid liquors of chlorine stills. The liquor, after neutralization with chalk, is treated with milk of lime, and the precipitate oxidized by blowing steam and air through it. The product is a dark semi-fluid sludge, of which the solid portion contains from 60 to 70 per cent. of manganese dioxide, on which account it is returned to the chlorine stills for use instead of the native manganese ore.

Welhaven, JOHAN SEBASTIAN CAMMERMEYER (1807-73), Norwegian author, born at Bergen. In 1830 he began a literary feud

with his brilliant contemporary, Henrik Wergeland. The quarrel led to the founding, by Welhaven and his friends, of *Vidør* (1832-4), the first critico-literary journal in Norway. After a continental tour, Welhaven published his first collection of poems, *Digte* (1839). In 1842 he became lector, subsequently professor, of philosophy at the university. Of his later poetical works the most important are *Nyere Digte* (1845), *Halvhundredte Digte* (1848), *En Digtsamling* (1859), all remarkable for deep feeling and a classical purity of style. Welhaven also contributed masterly criticisms of Holberg and Petter Dass to the *Nord Univ. Tidsskrift*, during 1854. His *Samlede Skrifter* were published in 1867-9.

Well. See WATER, ARTESIAN WELLS, BORING, SINKING.

Welland, tn., Ontario, Canada, co. Welland, 35 m. s.e. of Hamilton. Pop. (1901) 1,863. By means of the Welland Canal navigation is carried round the Niagara Falls and rapids; it was begun in 1824 and opened in 1829. It is now 26½ m. in length, and by means of twenty-six locks rises 326½ ft. It is navigable by vessels drawing 14 ft. of water, and cost £4,847,650.

Welland, riv., England, rises in Northamptonshire, flows N.E. to the Wash, below Fosdyke Bridge. It is navigable to Spalding. Length, 70 m.

Welle, riv. of equatorial Africa, rises in the Mangbattu country, and flows w. through the N. of the Congo Free State as the Makua or Welle to Yakoma, where it is joined on the r. bk. by the Bangasso. The united streams then flow, as the Ubangi or Mobangi, between the Congo Free State and French Congo, w. and s. to join the Congo on the r. bk. S. of the equator. The river was explored by Schweinfurth in 1870, and by Stanley and Grenfell.

Wellesley, RICHARD COLLEY, MARQUIS (1760-1842), governor-general of India, was born in Dublin; the brother of the 'Iron Duke.' He supported Wilberforce's efforts to suppress slavery; was appointed in 1786 a lord of the Treasury; in 1798 nominated governor-general of India. In seven years of vigorous administration he secured results unparalleled in the annals of the East India Company, foiling the machinations of Tipu Sahib (sultan of Mysore), dissipating the dreams of French dominion in India, and doubling the revenue of the company, the directors of which awarded him an annuity of £5,000. He was also created (1799) Marquis of Wellesley. In 1809 he was appointed British minister at Lisbon, and in 1821, and again in 1833, lord-lieutenant of Ireland.

Wellesley Province. See PROVINCE WELLESLEY.

Wellhausen, JULIUS (1844), German theologian and critic, was born at Hameln. He studied at Göttingen under Ewald, and became professor of theology at Greifswald in 1872. In 1882 he resigned his professorship, not being able conscientiously to adhere to the accepted standard of orthodoxy. He then obtained (1885) the post of professor of philology at Halle, and became professor of Oriental languages at Marburg in 1885. He is a thoroughgoing critic on the lines of Graf and Kuenen. He has

land, 7 m. s.w. of Taunton; has a fine town hall. On the Blackdown Hills (2½ m. s.) is the Wellington monument. Woollens are manufactured. Pop. (1901) 7,282.

Wellington, city, cap., and (since 1865) seat of government of New Zealand, at the southern extremity of North Island, on Cook Strait. There is deep water close to the shore (Port Nicholson). The city is cramped for space. Among the chief public buildings are Government House, Houses of Parliament, government buildings, general post office, government life insurance offices, town hall, and Harbour Board offices.



Wellington, New Zealand.

written *Prolegomena zur Geschichte Israels* (1878; later ed. 1887; Eng. trans. 1885); *Muhammed in Medina* (1882); and *Die Komposition des Hexateuch* (1889); and ed. the first three gospels (1903-4).

Wellingborough, mrkt. tn., Northamptonshire, England, 10 m. N.E. of Northampton. It has boot and shoe industries and iron works. Pop. (1901) 18,412.

Wellington. (1.) Town, Shropshire, England, 11 m. E. of Shrewsbury; manufactures agricultural implements and woodware. Pop. (1901) 6,273. (2.) Market tn., Somersetshire, Eng-

The chief industrial establishments are foundries, freezing works, woollen mills, soap and candle works, wax-match factory, pottery works, boot factories, and rope works. The exports reach some two millions annually, and the imports over three millions. Pop. (1901) 43,638; or, including suburbs, 49,344.

Wellington, hill station and military cantonment in the Nilgiris dist., Madras, India, 5 m. s.e. of Utakamand. It is the principal military sanatorium of Madras, and has an excellent climate. European fruits grow luxuriantly. Alt. 6,100 ft.

Wellington, ARTHUR WELLESLEY, FIRST DUKE OF WELLINGTON (1769-1852), was born (probably in Dublin) in the year of the birth of Napoleon. He learned the rudiments of war at the French academy in Angers. In 1793 he became intimate with Robert Stewart, the Castlereagh of another day, who had a marked influence on his career. He entered the Irish Parliament for the pocket borough of Trim. In 1787 he entered the army. In 1794 he covered, with great activity and skill, the retreat into Holland of the allies and of the Duke of York. He was sent to Calcutta in 1796. The military exploits of Wellesley were not at first brilliant.

Wellesley was at the bombardment of Copenhagen in 1807, and was chosen by Lord Cathcart to arrange the conditions of the surrender of the Danes. In that year he was chief secretary for Ireland, under the Duke of Richmond. His great career in the Peninsula began in 1808. He landed at Mondego Bay in Portugal with a small force; defeated Delaborde at Roliça, and Junot at Vimeiro in a hard-fought battle, and probably would have placed the French in extreme straits had he not been superseded in the command. The Convention of Cintra was severely condemned in England; but Wellesley, in some degree

rant of this, gave his best lieutenant, Masséna, a large army to 'drive Wellington and his forces into the sea;' but 'the spoiled child of fortune' was worsted at Busaco, recoiled before the invincible lines, and was compelled to retreat from Portugal with the mere wreck of a discomfited army. The gigantic enterprise of invading Russia in 1812 considerably weakened the French armies in Spain. Wellington suddenly pounced on Ciudad Rodrigo and Badajoz, the frontier fortresses on the side of Portugal, and captured both (1812) after desperate assaults. He was then engaged with Marmont, Masséna's successor, in a



Wellington, the Capital of New Zealand.

[Photo by Valentina.]

He was rather under a cloud at Seringapatam: he made a night march which was not successful. But his powers shone out brilliantly on the day of Assaye (1803), where he exhibited for the first time in war his capacity in offensive tactics, and won a battle almost as decisive as that of Plassey. The great excellences of Wellesley, however, in India in these years were his sagacity, moderation, and strict integrity. He restrained the ambition of a not scrupulous brother; insisted on faith being kept with the Indian princes, and showed himself especially averse to unjust conquests; above all, he did much to purify and improve the Indian civil service.

through Castlereagh's influence, was placed at the head of another army. He crossed the Douro in 1809, under the beard of Soult, and well-nigh cut off that able general's retreat. A few months afterwards he advanced into Spain; fought a brilliant and successful battle against Victor at Talavera, on the way to Madrid, but was nearly overwhelmed and caught by the French armies converging against him from many directions. This experience made Wellington—this was now his title—cautious. He resolved to establish himself in Portugal, and not prematurely to enter Spain. He constructed, therefore, the celebrated lines of Torres Vedras. Napoleon, igno-

fine game of manœuvres near the upper Douro, and he completely defeated his adversary at Salamanca. The British commander then made his way into Spain; he entered Madrid, but soon afterwards was compelled to raise the siege of Burgos. Once more he was nearly hemmed in by enemies gathering against him. The ruin of the 'grand army,' after the retreat from Moscow, gave Wellington in 1813 another favourable chance. He marched against the greatly-weakened French force, and won a decisive battle at Vitoria, near the verge of the Pyrenees. Napoleon dispatched Soult to arrest the progress of this formidable foe. An admirably conducted

struggle of many months followed, in which Soult more than once nearly gained success; but he was ultimately driven from the Pyrenees to Toulouse, where the war closed after a fiercely-fought engagement. The conduct of Wellington in this long and arduous contest was a magnificent instance of profound insight, of resolute constancy, of military capacity of a very high order, of powers of organization that deserve unqualified praise. Fortune no doubt seconded him in many respects. But probably Wellington's supreme gift was his indomitable firmness and grand strength of character, conspicuous throughout the contest. The British general was greatest when on the defensive. He understood the superiority of the British line over the French column: Busaco and Talavera are striking examples. It is a complete mistake, however, to suppose, with many French writers, that Wellington did not excel in offensive tactics. He had remarkable confidence and readiness in the field, and showed this conspicuously at Salamanca, Vitoria, and on other days of renown. Nevertheless strategy was not his strong point at any time. He ought not to have advanced to Talavera; his flank ought to have been turned at Busaco; he was outmanœuvred by Marmont before Salamanca; Soult more than once nearly caught him at fault; it is difficult to justify his flank march at Toulouse. Wellington, too, was deficient in one of the best gifts of a great captain: he was respected but not beloved by his officers and men.

For his triumphs in the Peninsular war Wellington was made a duke. It was his fortune, after Napoleon's return from Elba, to encounter that greatest of masters of war; his operations in Belgium are not his real crown of fame. The armies of Wellington and Blücher, about 220,000 strong, formed the northern column of the invading hosts about to overrun and subdue France; but they were widely separated from the huge eastern column. Napoleon therefore resolved to make a sudden spring on them, to enter Belgium, and, if possible, to defeat them in detail. (For the ensuing operations, see WATERLOO.)

By the consent of all the allied sovereigns, Wellington commanded the army of occupation in France; and in this delicate mission he gave signal proof of his prudence and his tact, and his power to secure discipline. He was subsequently employed in several great diplomatic trusts. But he was not a successful prime minister. He

belonged to the oligarchy that had ruled Ireland; he knew few public men when he first entered office; he made mistakes which cannot be denied; the difficulties which beset him in 1830 were immense. But three principles governed his public conduct, and on the whole command the respect of history: he disliked the Whig and Radical parties, at this time rather a danger to the state;

turned to its right mind: it accepted the dictatorship conferred on him in 1834. For the rest, his wisdom, his moderation, his high sense of duty, his perfect integrity, won the heart of England. His *Dispatches* were edited by Gurwood (15 vols. 1858-72). See *Lives* by Maxwell (ed. 1872), Hooper (1889), and Brialmont (1856); G. R. Gleig's *Personal Reminiscences of the Duke of*



The Duke of Wellington. From the portrait by Sir Thomas Lawrence, P.R.A.

he always wished 'to see the king's government strong'; he had profound sympathy with the loyal Irish Protestant class. As a statesman Wellington far excelled Marlborough, though he does not stand in the same rank as Canning and Peel; but for a quarter of a century he was a main pillar of the state. In the frenzy of reform in 1831-2 he became an object of popular wrath. But the nation soon re-

turned to its right mind: it accepted the dictatorship conferred on him in 1834. For the rest, his wisdom, his moderation, his high sense of duty, his perfect integrity, won the heart of England. His *Dispatches* were edited by Gurwood (15 vols. 1858-72). See *Lives* by Maxwell (ed. 1872), Hooper (1889), and Brialmont (1856); G. R. Gleig's *Personal Reminiscences of the Duke of*

Wellington (1904); *Personal Reminiscences of the Duke of Wellington*, by Francis, first Earl of Ellesmere (1903); and W. O'Connor Morris's *Wellington, Soldier and Statesman* (1904). **Wellington College**, Berkshire, England, incorporated 1853, was founded by public subscription in honour of the Duke of Wellington, for the education of the sons of deceased officers of the British army.



*The Meeting of Wellington and Blücher after Waterloo.
The central portion of the fresco by D. Meillon. P. A. in Westminster Palace.*

Wellingtonia, a name formerly given to the giant trees of California; it has been superseded by the generic name of Sequoi. See SEQUOIA.

Wells, mrkt. tn. and munic. bor., Somersetshire, England, at the base of the Mendip Hills, 19 m. s.w. of Bath; has a very fine cathedral (13th and 14th centuries), whose west front is a magnificent piece of sculptured work; the Lady Chapel is renowned for beauty and grace. Wells took its name from the holy springs, where King Ina built a monastery in 704; St. Andrew's Well still exists in the bishop's palace grounds. The bishopric is joined with Bath. Pop. (1901) 4,849.

Wells, SACRED. The reverence formerly paid to fountains and springs by most of the races of the Old World was only one of several manifestations of the worship of nature. In the mythology of Northern Europe the fountain of Urd is imagined as springing up at the roots of the world tree Yggdrasil. Among the Greeks and the Romans each river had its tutelary god or goddess. The nymphs were specially worshipped as the divinities presiding over hot springs. Offerings were made to the spirits of these various fountains. Gregory of Tours has left us a picture of the villagers feasting by a Gaulish lake, and throwing to the water-gods 'scraps of cloth and linen, and locks of wool, with little cakes of wax and figures of loaves and cheeses.' During the middle ages both church and state enacted laws against this cult. Religious services, usually ending in revelry, were performed beside these wells, and pilgrimages were made to them. Some were specially known as 'wishing-wells,' it being supposed that a wish solemnly made when depositing an offering would be fulfilled within the year. At certain wells, known as 'cursing-wells,' the wish took the form of a prayer for the death or the injury of an enemy. St. Elian's Well in Denbighshire was a noted example of a cursing-well. 'Pin-wells,' where the customary offering was a crooked pin, were very common. Others had a 'rag-bush,' or a tree growing near, on which rags were fastened or nailed as a gift to the water-spirit. There is one of this kind at Loch Maree, the theme of some beautiful verses by Whittier. Many of these 'holy wells' possess genuine therapeutic properties, and this obviously formed the basis of the belief that all or most of the wells regarded as sacred were efficacious in curing mental and bodily disease.

Wells, CHARLES JEREMIAH (?1799-1879), English poet, was born in London, and until the age of thirty practised as a solicitor. He was a friend of Hazlitt and of Keats. In 1822 he published *Stories after Nature* (new ed. 1891), and followed this up in 1824 with the drama of *Joseph and his Brethren*. This lay unnoticed until Rossetti in 1863 drew attention to its excellence. Then Swinburne, in a famous article in the *Fortnightly* (1875), proclaimed him as 'a poet meant to take his place among the highest.' Wells continued to write plays and poems, but on his wife's death (1874) he burned his manuscripts. In 1840 he had gone to live in Brittany, and subsequently removed to Marseilles, where he died. See Buxton Forman in Miles's *Poets of the Century* (ed. 1905), and Theodore Watts-Dunton in *The Athenæum* (1876 and 1879).

Wells, HENRY TANWORTH (1828-1903), English artist, born in London. When not more than seventeen he exhibited *Master Arthur Prinsep* at the Royal Academy. At first he confined himself to miniature painting, and in 1861 took up oil painting. He was elected A.R.A. in 1866, and in 1880 he exhibited *Victoria Regina*, which represents Queen Victoria receiving homage on the death of William IV. His largest picture, *The Queen and Her Judges*, is commemorative of the opening of the new law courts in London.

Wells, HERBERT GEORGE (1866), English novelist, was born at Bromley, Kent. He began life as a teacher (1883) and science master (1888). He was then a coach for London University examinations. His first article in the *Fortnightly Review* (1890) was on a metaphysical subject. He then wrote for the *Pall Mall Gazette*, and joined the staff of the *Saturday Review*; also on the staff of *Nature*. His novels have won him a wide popularity. *The Time Machine* (1895) was a bold, semi-scientific romance; *The Invisible Man* (1897) showed great imagination; *The War of the Worlds* (1898) was a fascinating mixture of weird adventure and scientific knowledge. The same may be said of *The First Men in the Moon* (1901), *The Sea Lady* (1902), and *The Food of the Gods* (1904). He has also written *Mankind in the Making* (1903), *Kippis* (1905), and *A Modern Utopia* (1905).

Wells, SIR THOMAS SPENCER (1818-97), English surgeon, was born at St. Albans. After serving as a surgeon in the navy till 1848 he settled in London (1853), where he lectured on surgery. He acted as a military surgeon during the Crimean war.

In 1858 he successfully performed the operation of ovariectomy, which became his recognized speciality as a surgeon.

Wellsville, tn., Columbiana co., Ohio, U.S.A., on the Ohio, 40 m. W.N.W. of Pittsburg; has railway workshops, iron, steel, and terra-cotta works. Coal is mined. Pop. (1900) 6,146.

Welsbach, CARL AUER VON (1859), Viennese chemist, who invented (1885) the mantle of metallic oxides for use with the ordinary bunsen gas burner. The mantle becoming incandescent gives a strong white light. See INCANDESCENT LIGHT.

Welsh Onion (*Allium pistulosum*), a Siberian perennial plant, very hardy in the British climate. Its roots, instead of 'bulbing,' as does the common onion, are long and tapering, and its stems and leaves are hollow. It is cultivated for its young growths, used to flavour salads in the spring. For this purpose seed should be sown in July or August.

Welshpool, munic. bor., Montgomeryshire, Wales, on the Severn, 8 m. N.W. of Montgomery; has trade in flannel. West is Powys Castle, containing a rich collection of works of art. Pop. (1901) 6,121.

Welsh Rabbit, a popular savoury, made of melted cheese, superimposed on a slice of toast. It is erroneously assumed by some to signify 'rare-bit,' and is so written occasionally. Kindred terms are 'Scotch woodcock,' 'Irish apricots,' 'Billingsgate pheasant,' 'Bombay duck,' 'Yarmouth capon.'



Welsh Terrier.

Welsh Terrier. The Welsh terrier is the careful evolution from a breed that was found in the rough state in the principality, and used for rabbiting and getting foxes out of rocks. Bangor and Carnarvon were the first towns to accord the breed special classes at shows, and the Welsh Terrier Club was formed to promote its welfare and define its characteristics and type. In appearance it is not unlike the Irish terrier, saving colour, and is a most gamy-looking dog. It should weigh from 18 to 22 lbs. Points:—A wire-haired black-and-tan terrier; head flat, and wider

at base than between eyes; stop well defined and eyes set rather wide; muzzle fairly long, with more punishing power than seen in the fox terrier; nose black; teeth perfectly level; ears small, V-shaped, and carried forward on the cheeks; neck rather long and clean; shoulders clean, strong, and sloping; ribs deep and well sprung; chest deep, but narrow; loins short and strong; thighs muscular; stifle fairly bent; hocks well let down; fore legs straight and well boned; pasterns firm; feet round and catlike, with sound pads; coat dense, hard, straight, and wiry, and about two inches long; colour black and tan, or grizzle and tan; free from white or pencilling on toes.

Welwitsch, Friedrich Martin Josef (1806-72), Austrian botanist, was born at Klagenfurt in Carinthia; entered the service of Portugal (1839), and had charge of the botanical gardens at Lisbon till 1853, and formed an exhaustive herbarium of the flora of the country. In 1853 he set out on a Portuguese expedition to Portuguese West Africa, which occupied him seven years, and was memorable for the discovery of the *Welwitschia mirabilis*. In 1863 he came to London for further botanical investigation, leaving the service of Portugal in 1866.

Welwitschia, a genus of plants belonging to the order Gnetaceae. The only species is *W. mirabilis*, a remarkable S. African plant, with a hard, brown, oboconical trunk, lying just along the ground, and giving rise to two flat, leathery, linear leaves, often over six feet in length. It bears cymes of small scarlet cones, within the scales of which the solitary flowers are contained.

Wem, mrkt. tn., Shropshire, England, 10 m. N. of Shrewsbury, with town hall (1905) and public library. Pop. (1901) 2,149.

Wemyss and March, Francis Charteris, Ninth Earl of (1818), British statesman, who, as Lord Elcho, acquired great popularity as a founder of the volunteer movement. He was a member of the House of Commons for E. Gloucestershire (1841), and Haddingtonshire from 1847 till 1883. Lord Elcho was a lord of the Treasury from 1852 to 1855.

Wen, a term popularly applied to any protuberant superficial tumour. Such a tumour may be either fleshy or cystic. In the latter case it results from distension of a cutaneous gland after the occlusion of its duct. In the human body the sebaceous glands are most liable to become affected in this way. A cystic wen should be transfixed and opened by a free incision. The thickened membrane around

it may then be grasped, and the whole tumour shelled out. Fleshy wens should be dissected out from the surrounding tissues.

Wenceslaus, or **WENZEL** (c. 908-935), patron saint of Bohemia; was converted to Christianity by his grandmother, Ludmilla. After ascending the throne of Bohemia, he was assassinated by his brother Boleslas because he attempted to make his people Christians. See Schuldes's *Der Heilige Wenzel* (1848).

Wenceslaus IV. (1361-1419), king of Bohemia and emperor of Germany, son of the Emperor Charles IV., succeeded to the Bohemian crown in the third year of his age, and to the empire in 1378. A weak yet at times tyrannical and somewhat fickle prince, he incurred the enmity of his nobles, and was by them seized and imprisoned (1394 and 1400-2), and finally he abdicated in favour of his brother Sigismund (1411). See *Life*, in German, by Pelzel (1788-90).

Wen-chow, city and treaty port, prov. Che-kiang, China, on riv. Wu, about 20 m. from its mouth. Formerly the centre of Japanese trade with China, it is now no longer of commercial importance.

Wendover, tn., Bucks, England, 5 m. S.E. of Aylesbury. Pop. (1901) 2,009.

Wends, Slav community in Upper and Lower Lusatia (Saxony and Prussia). They call themselves Sorbs, and formerly occupied nearly the whole of the Elbe basin; hence are known in history as Polabs. Their language, of which there are two marked dialects—the Saxon and the Prussian—with numerous local and half Germanized varieties, holds an intermediate position between Polish and Czech (Bohemian), and was first reduced to written form in the 16th century. It is steadily yielding to the encroachments of German; and the people of Wendish speech, who in the 'eighties numbered 144,000, were by 1900 reduced to 116,800, of whom 24,000 were bilingual, speaking German as well as their mother tongue. In dress, customs, and religion they are largely assimilated to their German neighbours. See R. Andree's *Das Sprachgebiet der lausitzer Wenden* (1873), E. Müller's *Das Wendenthum* (1894).

Wendt, Hans Hinrich (1853), German philosopher and theologian, born at Hamburg, became professor of theology at Göttingen (1881-3), thereafter professor of New Testament exegesis in Kiel (1883-5), then of systematic theology at Heidelberg (1885-93), and finally was called to Jena. His chief works are *Die Christliche Lehre von der Menschlichen Voll-*

kommenheit (1881); *Die Apostelgeschichte*, in Meyer's *Kommentar* (1899); *Das Johannevangelium* (1900; Eng. trans. 1902); *Die Norm des echten Christenthums* (1893); *Der Erfahrungsbeweis für die Wahrheit des Christenthums* (1897); and *Die Lehre Jesu* (2nd ed. 1901; Eng. trans. 1892); and *The Idea and Reality of Revelation and Typical Forms of Christianity* (1904).

Wener, Lake. See **VENER**.

Wenlock (including MUCH and LITTLE WENLOCK), munic. bor., Shropshire, England, 14 m. S.E. of Shrewsbury. It has remains of a Clunian priory, founded about 1080. Pop. (1901) 15,866.

Wenlock Beds, a series of upper Silurian rocks, well developed in western England. To this series belong the highly fossiliferous limestone rocks known as Dudley Limestone.



Wentletrap (*Scalaria pretiosa*).

Wentletrap (*Scalaria*), a genus of gastropod molluscs, related to *Turritella*. The shell is beautiful, being usually of a pure lustrous white colour, and spiral in shape, with many whorls. In the forms from warm seas the whorls are not close together, and they are always ornamented by a series of elevated ribs. Four species are British, of which *S. communis* has a prettily coloured shell; but the most beautiful forms are tropical, and were formerly highly valued by collectors. The precious wentletrap (*S. pretiosa*), from the China Seas, is the largest and most valuable species.

Wentworth, Thomas. See STRAFFORD, FIRST EARL OF.

Wentworth, William Charles (1793-1872), Australian statesman and reformer, was born in Norfolk, and admitted to the English bar (1822), returning to Sydney to practise as the first barrister in the country. He established the *Australian newspaper* in order to advocate the cause of the emancipists. He was a strong advocate of colonial responsible government, although he was not a democrat. He led the 'squatters'; would have nothing to do with the agitation against transportation, quarrelling with Robert Lowe (Viscount Sherbrooke) on that question. He strongly advocated the creation of a colonial peerage, but unsuccessfully.

Werdau, tn., kingdom of Saxony, Germany, on the Pleisse, 30 m. s. of Leipzig. Its industries include dyeing and wool-spinning, the manufacture of machinery, motors, and chemicals. Pop. (1900) 19,355.

Werden, tn., Rhine prov., Prussia, on the Ruhr, 6 m. by rail s. of Essen; has manufactures of woollen goods, paper, and shoes. Coal is mined and stone quarried near. Part of the Benedictine abbey, founded in 796, is now a prison. Pop. (1900) 10,704.

Weregild, in Anglo-Saxon and Teutonic law, a fine or pecuniary compensation prescribed for homicide or other crime against the person. It varied in amount according to the offender's rank and station, and that of the person slain or hurt, and also according to the injury sustained. It was in general paid to the relatives of the deceased, or in the case of injury to the person wounded. If the cause was taken into court, the plaintiff only received a portion of the fine, the community or the king receiving the other half.

Were-wolf. See LYCAN-THROPY.

Wergeland, HENRIK ARNOLDUS (1808-45), Norwegian poet, born at Kristiansund. In 1827 he made his debut in letters with a farce, and when only a little over twenty composed what he regarded as his *magnum opus*, the epic *Skabelsen, Mennesket, og Messias*, which comprises a whole philosophy of life, and despite its wildness, obscurity, and formal crudeness, is marked throughout by original genius. About this time (1830) began his literary feud with Welhaven and his polemical writings on behalf of an independent Norway. From 1829 his name was both the banner and the watchword of the progressive party, especially after he became the editor of the most bitter of the opposition journals, *Statsborgeren* (1835-7). In 1839 Charles XIV. offered him a pension, which he accepted as an honorarium for 'voluntary labour on behalf of popular enlightenment,' to the intense indignation of his political friends and the malicious delight of his enemies. In 1835 he published the tragedy *Barne-mordersken*; in 1840 *Jan van Huysum's Blomsterstykke*; in 1842 *Jöden*, and in 1844 *Jödinden*, in both of which he courageously advocated the political emancipation of the Jews; in 1844 *Den Engelske Lods*; and in 1845 *Husselnsödder*. In 1839 he was made keeper of the record office. Wergeland is one of the most original of Norwegian authors. His *Samlede Skrifter* were

edited by Lassen in 3 vols. (1852-57). See Lassen's *Wergeland og hans Samtid* (ed. 1877); Schwanenflügel's *Henrik Wergeland* (1876); and Skavlan's *H. Wergeland* (1892).

Werner, ABRAHAM GOTTLÖB (1750-1817), German mineralogist and geologist, born at Wehrau in Lusatia; was appointed (1775) professor of mineralogy at Freiberg in Saxony. His theory, in which, roughly put, he held that rocks were primarily of aqueous origin, led to the controversy which divided geologists into two parties, styled Neptunists and Vulcanists. The former was the name applied to the followers of Werner, and the latter to his opponents, of whom the most redoubtable was James Hutton. He wrote *Ueber die äussern Kennzeichen der Fossilien* (1764); *Kurze Klassifikation und Beschreibung der Gebirgsarten* (1787); and *Neue Theorie über die Entstehung der Gänge* (1791). See *Life* by Frisch (1825).

Werner, ANTON ALEXANDER VON (1843), German painter, born at Frankfurt-on-Oder; lived for some years in Italy. He became professor (1873) at the Berlin Academy of Fine Arts, and (1875) director of the same. Many of his most important works are the property of the state—*The Capitulation of Sedan*; *Meeting of Bismarck and Napoleon III.*; the two companion pictures, *Moltke before Paris* and *Moltke at Versailles*; *William I. Visiting the Tombs*; *The Congress of Berlin*.

Werner, ELISABETH, pen-name of Elisabeth Bürstenbinder (1838), German novelist, known under the pseudonym of 'E.', born in Berlin; has written novels distinguished by singular grace of style and lively dialogue—e.g. *Am Altar* (1873; Eng. trans. *Sacred Vows*, 1878); *Freie Bahn* (1893; *Clear the Track*, 1893); *Frühlingsboten* (1880); *Fickle Fortune*, 1881); *Gebannt und Erlöst* (1884); *Raymond's Statement*, 1884); *Gesprenzte Fesseln* (1875; *Riven Bonds*, 1885); and *Glück Auf* (1874; *Good Luck*, 1890). Many of them were collected as *Gesammelte Novellen* (10 vols. 1893-6; new series, 1901, etc.).

Werner, FRIEDRICH LUDWIG ZACHARIAS (1768-1823), German poet, born at Königsberg. The first years of his life were largely spent in sowing wild oats, but in his forty-second year he pulled himself up (1809), joined the Church of Rome (1811), was consecrated priest (1814), and became noted as a pulpit orator. Before this change, his works had mostly been dramas of a gloomy cast, betraying great power, but almost repellent in their aggressive

scepticism. His best-known works are *Die Söhne des Thals* (1803), a dramatic poem, divided into the two parts—(1) *Die Tempeler auf Cypern*, (2) *Die Kreuzesbrüder*; *Das Kreuz an der Ostsee* (1806); *Martin Luther* (1807); *Die Mutter der Makkabäer* (1820). See Carlyle's *Miscellanies*, and Madame de Staël's *L'Allemagne*. The best biographies are by Hitzig (1823), Schütz (1841), and Düntzer (1873).

Wernigerode, tn., prov. Saxony, Prussia, at the foot of the Harz Mts., 43 m. s.w. of Magdeburg; has a fine library in the old castle. Machinery and cigars are manufactured. Pop. (1900) 11,567.

Werther. See GOETHE.

Wesel, tn., Rhine Province, Prussia, at confluence of Lippe and Rhine, 35 m. by rail N.W. of Düsseldorf. Machinery, pottery, bricks, cloth, and soap are manufactured. The Willibrord church is a Gothic structure, dating from the 12th century. Pop. (1900) 22,545.

Weser, riv., Germany, rises as the Werra and Fulda, which join at Münden and flow N. to Bremen. From there the river flows for 40 m. between Oldenburg and Prussia, and enters the North Sea 25 m. s.w. of the mouth of the Elbe. It is 440 m. long, and is navigable as far as Münden. The Fulda is canalized to Kassel. The chief tributary is the Aller.

Wesley, CHARLES. See WESLEY, JOHN.

Wesley, JOHN (1703-91), English religious reformer, was born at Epworth, Lincolnshire; was in 1726 elected fellow of Lincoln College, Oxford, having been ordained in 1725. At the same college his younger brother, Charles Wesley (1707-88), became a member of a religious society derisively called the 'Holy Club,' or 'Methodists.' Other members were James Hervey, author of *Meditations among the Tombs*, and George Whitefield, one of the founders of Methodism. At this time, too, the brothers became acquainted with William Law, author of the *Serious Call*, who exercised a great influence upon them. John and Charles were prevailed upon to accompany General Oglethorpe to Georgia, N. America, to preach to the settlers and Indians in a colony which the general was founding there. They sailed from Gravesend in October 1735, and landed on the banks of the Savannah in February 1736. Charles was sent back with dispatches by General Oglethorpe early in 1737, but John Wesley did not leave the colony until December of the same year. On his return he found that the re-

ligious enthusiasm which passed by the name of Methodism had been much stimulated by the fervid preaching of Whitefield, who had just gone out to succeed Wesley in Georgia for a year. Wesley was at first inclined to throw in his lot with the Moravians, and both he and Charles owed much to a Moravian missionary, Peter Boehler. About three weeks after his 'new birth,' as he called it, Wesley set out for Germany to visit the Moravian Brethren at their original seat of Herrnhut in Saxony, spending about three months there (June to September 1738). On the arrival of Whitefield, in November, Wesley at once joined him, and they became intimately associated in religious work. The example of preaching in the open



John Wesley.

(Portrait by J. Jackson, R.A.)

air, which Whitefield initiated, was followed by Wesley, while the first separate meeting house of the Methodists was erected in the Horse Fair, near St. James's Church, Bristol (1739). Lay preaching was also sanctioned. In July 1740 John Wesley formally separated himself from the Moravians, and adopted that system of doctrine and practice now embodied in the standards of the Wesleyan Methodist, Primitive Methodist, and Methodist Episcopal Churches. From this date Wesley worked as the evangelist and missionary organizer. Until his death practically his whole time was given up to preaching, writing books, and travelling from place to place expounding the Word of God. He rarely preached less than three times a day, while he generally rode about forty or fifty miles a day. His brother Charles

at this time, as all through, was his faithful coadjutor. About 1738 John Wesley began the gradual establishment of his 'societies,' or churches. In 1743 he drew up a set of rules for them—the rules of the Wesleyan Church to this day. At first the societies were in connection with the Church of England; but Wesley and the preachers he ordained were soon excluded from the pulpits of the Anglican communion. After reading Lord Chancellor King's account of the primitive church, Wesley came to the conclusion that he and Charles had as much right to ordain clergy in accordance with a system of their own as the primitive church had. Thus the Wesleyan organization took shape. In 1741 he also reorganized his staff of lay preachers; and in 1744 the first conference of the societies was held, but it was not legally constituted as the supreme court of a church, dissociated from the Church of England, until 1784. During these years, between 1743 and 1785, the organization increased by leaps and bounds, until it spread all over England. In 1785 Wesley made provision for its extension to America, by giving formal ordination to Dr. Coke, a presbyter of the Church of England, and the Methodist Episcopal Church came into existence. In 1785 Wesley sent his preachers to Scotland, and shortly afterwards a special form of organization, adapted to Scottish prejudices, came into existence. In 1749 Charles was married to Sarah Gwynne of Garth in Brecknockshire. John was a witness of their conjugal happiness, and in 1751 he married a widow named Mrs. Vizzle. But Wesley had stipulated that he was not to change his mode of life, and his wife being a woman of violent temper, his life was miserable for many years, until she at last left him. Charles confined himself almost wholly to London. He had not his brother's powers of speech, but he had a decided poetical faculty, which he employed in writing hymns. The two Wesleys were not mere ecclesiastics. They were great social reformers and philanthropists. Charity schools were founded by them in London, with an orphans' home in Newcastle, and a medical dispensary for the poor in Bristol.

The works of Charles are contained in the *Methodist Hymnal*, and in the *Poetical Works of John and Charles Wesley* (13 vols. 1868-72). A volume of his *Sermons*, with *Memoir* by J. Jackson, appeared in 1841, and his *Journal*, edited by the same, in 1489. Perhaps John's best single treatises

were his *Notes on the Old and New Testaments* (1764), and his *Doctrine of Original Sin* (1757). His complete *Works* appeared in 1818, the eleventh edition containing a *Life* by T. Beecham, and preface by J. Jackson, being published in 15 vols. (1856-7). *Lives* of John Wesley have been written by Southey (1820; new ed. 1903); Tyerman (1870; new ed. 1897); Wedgwood (1870); Urllin (1870); Rigg (1875); Telford (1876; new ed. 1899); Overton (1891); Kirkton (1893); Snell (World's Epoch Makers, 1899); and Winchester (1906); of Charles Wesley, by Jackson (1841); and of the Wesley family, by Stevenson (1876). See also *Wesley and his Century*, by Dr. Fitchett (1906).

Wesley, SAMUEL SEBASTIAN (1810-76), English musical composer, was born in London, and became one of the boys at the Chapel Royal (1819). He was chosen organist of Hereford cathedral (1832), and there produced his anthem *The Wilderness*. He was subsequently organist at Exeter cathedral (1835), and at Leeds parish church (1842), and in 1865 at Gloucester cathedral. Many stories are told of his eccentricities.

Wesleyan Methodist Churches. See METHODISM.

Wessel, JOHANN (1420 89), sometimes called Gansfort or Goesvort, Dutch theologian and reformer, born at Groningen, and brought up by the Brethren of the Common Life. He was called 'Lux Mundi' by his friends, but 'Magister Contradictionum' by his enemies, because of his strenuous opposition to the prevalent Scholastic philosophy. See Ullmann's *Reformers before the Reformation* (1866).

Wessex, KINGDOM OF. In 494 Cerdic landed on Southampton Water, and after years of warfare became king of the West Saxons, or Wessex. For some years the West Saxons halted, and did not advance as far west as Bath. About 570 Ceawlin of Wessex began to make fresh conquests. In 571 he won a victory at Bedford, and in 577 he fought and won the battle of Deorham in Gloucestershire. The West Saxons by this victory secured access to the Bristol Channel, and won Cirencester, Gloucester, and Bath. The Welsh of Wales were now cut off from the Welsh in Somerset, Devon, and Cornwall. From 613 to 825 Northumbria, Mercia, and Wessex struggled for supremacy. Cenwealh (643-72) and his successors, Cædwalla and Ine, extended the borders of Wessex. Somerset was conquered; London recognized the West Saxon power; and laws were issued. It was not, how-

ever, till the reign of Egbert (802-39) that the supremacy of Wessex over Northumbria and Mercia was in any sense assured. Nevertheless the union of England under Egbert was premature, and it required the Danish invasions to force the men of Northumbria and Mercia to recognize the overlordship of Wessex. It was not till after the treaty of Wedmore that Alfred was able to begin the work of reconquering England from the Danes. His successors, Edward the Elder, Athelstan, Edmund, Edred, and Edgar, continued his work; and in Edgar's the royal power reached its highest point. The shire system originated in Wessex. From the death of Edgar in 975 to the accession of Canute in 1016, Wessex passed through evil days owing to the attacks of the Danes, who succeeded in placing a Danish dynasty on the throne. See *Wessex*, by W. Tyndale and C. Holland (1906).

West, BENJAMIN (1738-1820), American historical painter, was born in Pennsylvania, and practised as a portrait-painter in New York and Philadelphia before he went to Rome in 1760. He settled in England, and by his picture, *Agrippina Landing with the Ashes of Germanicus*, secured the patronage of George III. By abandoning the pseudo-classic in his *Death of General Wolfe*, he revolutionized English historical painting. Many of his works are in Windsor Castle. *Edward III. at Cressy*, *Penn's Treaty with the Indians*, and *The Battle of La Hogue*, are among his best known works. He succeeded Reynolds as president of the Royal Academy in 1792. See Allan Cunningham's *Lives of . . . British Painters* (new ed. 1879).

West Africa, BRITISH. See GOLD COAST, LAGOS, GAMBIA, SIERRA LEONE, and NIGERIA.—FRENCH. See SENEGAL PROTECTORATES, FRENCH GUINEA, FRENCH CONGO, IVORY COAST, and DAHOMEY.—PORTUGUESE. See ANGOLA and PORTUGUESE GUINEA.—GERMAN. See KAMERUN, TOGOLAND, and GERMAN SOUTH-WEST AFRICA.

West Bay City, city, Bay co., Michigan, U.S.A., in the lower peninsula, on Saginaw R., near its mouth. Principal industry, lumber. Pop. (1900) 13,119.

Westboro, tn., Worcester co., Massachusetts, U.S.A., 32 m. S.W. by rail of Boston, has a state lunatic asylum. Boots and shoes are manufactured. Pop. (1900) 5,400.

West Bromwich, munic. par. and co. bor., Staffs, England, 6 m. N.W. of Birmingham, and adjoining Wednesbury. The

High Street is $1\frac{1}{2}$ m. long. The town is noted for hardware manufactures; has forges, and foundries. Coal is mined. Pop. (1901) co. and par. bor. 65,175.

Westbury, tn., Wilts, England, 4 m. S. of Trowbridge. It has iron works and manufactures of woollens. Pop. (1901) 3,300.

Westbury, RICHARD BETHELL, BARON (1800-73), lord chancellor of England, was born at Bradford-on-Avon. He became a fellow of Wadham College, Oxford, and was called to the bar at the Middle Temple in 1823. He entered Parliament as Liberal member for Aylesbury in 1851, and for Wolverhampton in 1852. He was made solicitor-general in 1852, attorney-general in 1856, and succeeded Lord Campbell on the woolsack in 1861. He delivered the celebrated judgment, in the House of Lords, on the appeals in the *Essays and Reviews* cases. He was in opposition to Gladstone on the Irish Church question, and voted against the Land Act of 1870. See *Life* by T. A. Nash (1888).

West Calder, tn. and par., Midlothian, Scotland, 16 m. by rail W.S.W. of Edinburgh; is in the middle of coal, shale, and ironstone district. Pop. (1900) 2,652; of par. 8,091.

West Chester, residential centre and cap. of Chester co., Pennsylvania, U.S.A., 25 m. W. of Philadelphia; has market-gardening and dairy-farming. Pop. (1900) 9,527.

Westcott, BROOKE FOSS (1825-1901), bishop of Durham, was born at Birmingham. In 1851 he became a house master at Harrow. In 1869 he was made canon of Peterborough. In 1870 he was elected regius professor of divinity at Cambridge, and the same year acted on the committee for the revision of the New Testament. In 1884 he received a canonry at Westminster. In 1890 he was made bishop of Durham. Bishop Westcott had the gift of attracting and influencing all, especially young men, who came within his sphere, and was keenly interested in social reforms. As a writer and teacher he united deep learning with a mystical spiritual insight peculiarly his own. A few amongst his best-known works are *History of the Canon of the N. T.* (ed. 1866); *The Gospel of the Resurrection* (1866); *The N. T. in the Original Greek* (with Dr. Hort, 1882); *The Revelation of the Risen Lord* (1881); *The Revelation of the Father* (1884); *Christus Consummator* (1886); *The Incarnation and Common Life* (1893); and *Words of Faith and Hope* (1902). See *Life* by his son, B. F. Westcott (1903), and by J. Clayton (1906).

Westerås. See VESTERÅS.

Westerly, tn., Washington co., Rhode I., U.S.A., 40 m. S.S.W. of Providence; has cotton and woollen factories. Granite is quarried. Watch Hill is a bathing resort. Pop. (1900) 7,541.

Western Australia, a state of the Australian Commonwealth, extends from $13^{\circ} 30'$ S. to West Cape Howe $35^{\circ} 8'$ S., and from Dirk Hartog's I. in long. $112^{\circ} 52'$ to 129° E. Greatest length from N. to S., 1,480 m.; greatest breadth, about 1,000 m. Total area, 975,875 sq. m., or, roughly, about one-third of the Australian continent. The first Englishman who landed on the coast of what was then New Holland, on Jan. 5, 1688, was Dampier. It was on May 2, 1829, that Captain Fremantle hoisted the British flag. The same year Captain Stirling arrived with the first settlers. In 1830 an Executive Council was appointed, and in 1831 the first Legislative Council came into existence. Western Australia did not make the same rapid progress as the rest of Australia until 1890, when, with a population of about 40,000, it was granted responsible government. Since then its progress has been extraordinarily rapid. Sir John Forrest formed the first ministry, and continued to hold office as premier until 1901. Under his administration state-owned railways were extended to the principal centres; Fremantle was made a first-class port, at an expenditure of over £1,000,000; water is being taken to the mining towns of the interior at an estimated cost of £3,500,000; and a liberal policy of public works has been carried out. This was made possible by the discovery of gold at Coolgardie in 1892. Length of coast line, 5,200 m.; but good harbours are not very numerous. The principal harbour is Fremantle, a few miles below Perth, the capital. The principal river is the Swan; others are the Murchison, Gascoyne, Ashburton, De Grey, and Fitzroy. The climate varies from the excessive heat of latitudes just below the equator to the temperate and cool atmosphere of the south. The north is in every way suited for tropical agriculture, while in the south English cereals, fruits, and vegetables are grown. The rich, black soil of the south-west yields marvellous crops, and has a rainfall averaging from 30 to 40 in., evenly distributed throughout the year. The north of the state is for the most part suited for pastoral occupation. The vast and arid plateaus along the eastern boundary are worthless for settlement; but, owing to scarcity of water, they have hitherto scarcely been prospected for

minerals. Western Australia produces gold, silver, lead, copper, tin, iron, excellent coal, and even gems. To the end of 1904 gold has been produced to the value of £54,865,260, the production in 1904 being 84 millions sterling. A source of great wealth is the forest timber, of which over 10,000,000 acres are karri and jarrah, two of the most valuable hard woods known. Wine is a large product. The fauna is the same as that found elsewhere in

Kingdom. The government is that of an autonomous British colony, with a Legislative Assembly of fifty members, and a Legislative Council of thirty members. The governor of the state holds authority from the crown direct. There is no state church. All denominations have their representatives, including missions to the aborigines. Education is compulsory, secular, and free. There is a small permanent military force and a volunteer

politics. Its present proprietor is Mr. Walter Reid.

Western Empire. See **ROME**.
Western Railway of France, established in 1855, was formed by the amalgamation of five companies, and extends from Paris to Rouen, Dieppe, Brest, and comprises most of the lines in Normandy and Brittany. The total length worked is 3,370 m. The government guarantees until 1935 a dividend equivalent to 38'50 francs (£1, 10s. 5d.) per share.

Westfield, tn., Hampden co., Massachusetts, U.S.A., 8 m. w. of Springfield, on the riv. Westfield; has manufactures of machinery, paper, cigars, and whips. Pop. (1900) 12,310.

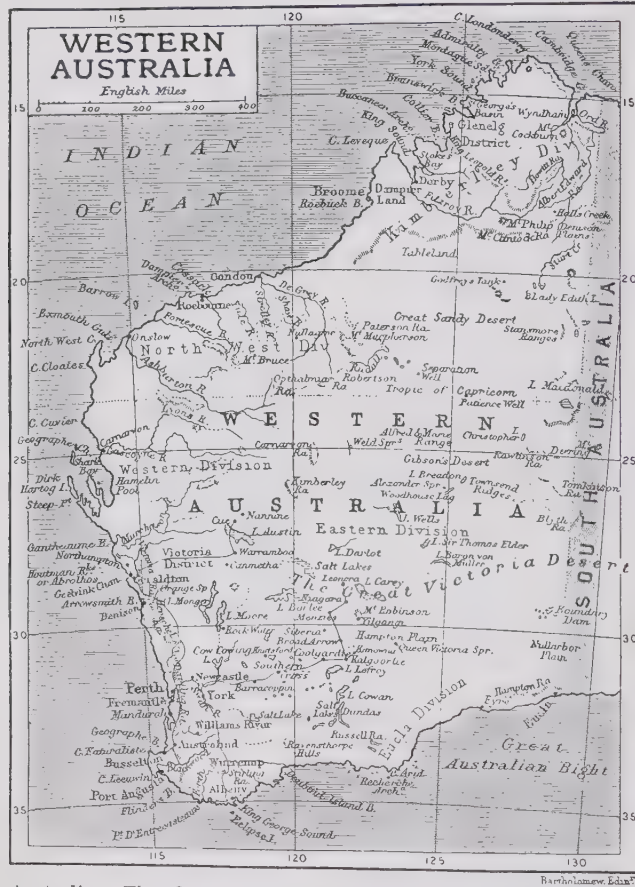
Westfield College, Hampstead, a constituent college of the University of London, was founded in 1881 for the preparation of women for the degrees of the university. It accommodates about sixty resident students, for whom the fees are £35 per year; it also receives non-residents.

Westgate-on-Sea, wat.-pl., Kent, England, on St. Mildred and Westgate Bays, 2 m. s.w. of Margate. Pop. (1901) 2,738.

West Ham. See **HAM**.

Westhoughton, tn., Lancashire, England, 5 m. E.N.E. of Wigan. It has silk and cotton factories, print works, and collieries. Pop. (1901) 14,377.

West Indies, an archipelago stretching from Florida to the N. coast of Venezuela. It includes forty inhabited islands, varying in area from less than 5 to 45,000 sq. m. They are classified as the Bahamas, the Greater Antilles, the Lesser Antilles (including the Leeward Is. and the Windward or Caribbee Is.), Trinidad-Tobago group, and the keys or coral reefs. Of these, the Greater Antilles are the most important. They include Porto Rico, Santo Domingo, Cuba, and Jamaica. These islands, and the shallow passages between them, separate the Gulf of Mexico from the Caribbean Sea. They have three times the population of the other islands, and nearly nine-tenths of the entire surface of the West Indian group. They are a disconnected chain of mountains, with an east and west trend, and protrude at intervals above the sea, with the greatest elevation, 12,000 ft., in Santo Domingo. They are rich fruit, coffee, and cotton lands. The Bahamas, to the N. of the Greater Antilles, consist of low heaps of calcareous shells and coral sand, which have been piled upon a submerged platform by wind and rain. The 3,200 islands contain 5,450 sq. m., and include the Caicos and Turks.



Australia. The flora, in addition to that common throughout Australia, has many varieties not found elsewhere. Manufacturing industries are springing up, but their volume is still unimportant. Pearl-shelling is an important industry, and a large amount of guano is shipped from Abrolhos I. In 1904 the imports were £6,672,480, and the exports £10,271,510, the trade being almost entirely done with the other colonies and the United

reserve, amounting in all to between two and three thousand men. Pop. (1901) 184,124, excluding 6,212 natives. See A. F. Calver's *Western Australia* (1894); J. M. Price's *The Land of Gold* (1896); and Vivienne's *Travels in Western Australia* (1901).

Western Daily Press, THE, was the first daily newspaper to be issued in the west of England. It was founded by Peter Stewart MacIver at Bristol in 1858, on independent lines in regard to

The Virgin Archipelago, which extends E. from Porto Rico to the Anegada Passage, is Antillean in its natural features. It includes Crab, Culebra, St. Thomas, St. John, Tortola, Virgin, and Anegada. The Lesser Antilles are projecting summits of a submerged ridge. They curve from the Anegada Passage S. to Trinidad, and number twenty-one islands, besides the Grenadines. The northern half of the chain makes a double row of islands. The inner, which stretches between the Greater Antilles and S. America, is the main chain, and includes, Saba, St. Eustatius, St. Christopher, Nevis, Montserrat, Guadeloupe, Dominica, Martinique, St. Lucia, St. Vincent, Grenadines, and Grenada. They rise precipitously above the sea, attaining a height of 4,450 ft. in Martinique, and are clad to the top with vegetation, and usually clouded in mist. They are composed entirely of old volcanic material. The outer chain of islands, including Sombrero, Anguilla, St. Martin, St. Bartholomew, Barbuda, Antigua, Desirade, and Marie Galante, with the exception of Antigua, which is partially volcanic, are limestone and coral rocks, and are nowhere over 200 ft. above the sea. They rise from a submerged slope extending oceanward from the inner chain. The fourth group border the N. coast of S. America, and include Tobago, Trinidad, Margarita, Blanquilla, Los Roques, Buen Ayre (Bonaire), Curaçao, Aruba, and other small islands. These were once portions of the S. American continent. There are many islands standing isolated, like Barbados, Aves, and Swan I., and many others off the Central American coast, which, from their natural relations, may be considered continental. Several of the islands suffer from earthquakes and volcanic outbursts.

A great drawback to the W. Indies is their political condition. Only two islands, Santo Domingo (with Haiti) and Cuba, possess free and independent governments. The Spanish islands Crab or Vieques and Culebra passed to the United States after the Spanish-American war. British islands — Bahamas, Jamaica, Turks, St. Christopher, Nevis, Antigua, Montserrat, Dominica, St. Vincent, Grenada and Grenadines, Barbados, Virgin Is., St. Lucia, Tobago, Trinidad. American — Porto Rico. French islands — St. Bartholomew, Guadeloupe, Martinique. Dutch islands — St. Eustatius, Saba, Curaçao, Buen Ayre, Aruba. French and Dutch — St. Martin. Danish — St. Thomas, St. John, and Santa Cruz. A proposal was made in 1904 to sell

the Danish islands to the United States, but the bill was rejected by the Danish Parliament.

The W. Indies were discovered by Columbus in his different voyages from 1492 to 1498. First, the Spaniards conquered the aborigines; then English, Dutch, French, and Danes strove for possession of them, and even individuals, as pirates and buccaneers, took part in the scramble. Here Morgan, Drake, Grenville, De Grasse, Rodney, Nelson, Albemarle, and others won victories or suffered defeat. African slaves, imported to cultivate the sugar plantations, rose from time to time in revolt, and were usually suppressed with appalling loss of life, but in some cases they won a success so complete as to banish European life and civilization. See Fiske's *The West Indies* (1899); Froude's *The English in the West Indies* (1888); R. T. Hill's *The Geology and Physical Geography of Jamaica, Cuba, and Porto Rico, with the other Islands of the West Indies* (1898); Bulkeley's *The Lesser Antilles* (1889); Dodsworth's *The Book of the West Indies* (1904); Eves's *The West Indies* (ed. 1897); Rodway's *The West Indies and the Spanish Main* (1896); Garaud's *Trois Ans à la Martinique* (1892); Stoddard's *Cruising among the Carribees* (1896); Walker's *The West Indies and the Empire* (1901); and Lucas's *The West Indies* (2nd ed. 1905). For the Danish islands, C. E. Taylor's *Leaflets from the Danish West Indies* (1888).

Westinghouse, GEORGE (1846), American inventor, born at Central Bridge, Schoharie co., New York. After serving in the Union army (1863-4), he became an assistant engineer in the United States navy; invented a device (1865) for replacing railway cars on a track in case of accident; afterwards (1868) invented the Westinghouse air-brake, and numerous other railway appliances.

Westinghouse Brake. See BRAKE.

Westland, provincial dist., South Island of New Zealand, a narrow strip of country on the west coast, 200 m. long by 30 m. broad, with an area of 4,641 sq. m. It is a vast alluvial gold field, sloping from the Southern Alps to the ocean. Chief towns: Grey-mouth, Hokitika, Kumara, and Ross. Chief products: gold, timber, and coal. Pop. (1901) 14,506.

Westmacott, SIR RICHARD (1775-1856), English sculptor, was born in London, and was a pupil of Canova in Rome. He returned to London (1797), became R.A. (1811), and was knighted in 1837. His work was chiefly of a monumental character, and favourable specimens are to be seen in his monu-

ments to Pitt, Fox, and Addison, in Westminster Abbey; to Abercromby and Captain Cook, in St. Paul's; in the *Achilles*, a colossal bronze statue in Hyde Park; and, jointly, with Flaxman and Baily, he executed the reliefs on the Marble Arch. He was professor of sculpture at the Royal Academy from 1827 until his death.

Westmacott, RICHARD (1799-1872), English sculptor, son of the above, was born in London, and lived in Italy (1820-6). After his return to England he became famous; was created R.A. in 1849, and appointed (1857) to the professorship of sculpture. His work latterly consisted chiefly of busts, including Newman, Lord John Russell, and Sir Roderick Murchison; but he also produced *Ariel* (1841), *The Soul Enslaved by Sin* (1847), and *David* (1852).

Westmeath, inland co., prov. Leinster, Ireland. The surface is varied and very picturesque, with scattered hills (highest in N. 850 ft.). It is drained chiefly to the Shannon; E. are affluents of the Boyne. The Royal Canal crosses the centre. Lakes form a characteristic feature. On the Shannon is Lough Ree. Agriculture is the chief occupation, oats and potatoes being the principal crops; and dairy-farming is important. Coarse stuffs are manufactured for domestic use. The county returns two members to Parliament. Area (admin. co.), 708 sq. m. Pop. (1901) 61,629.

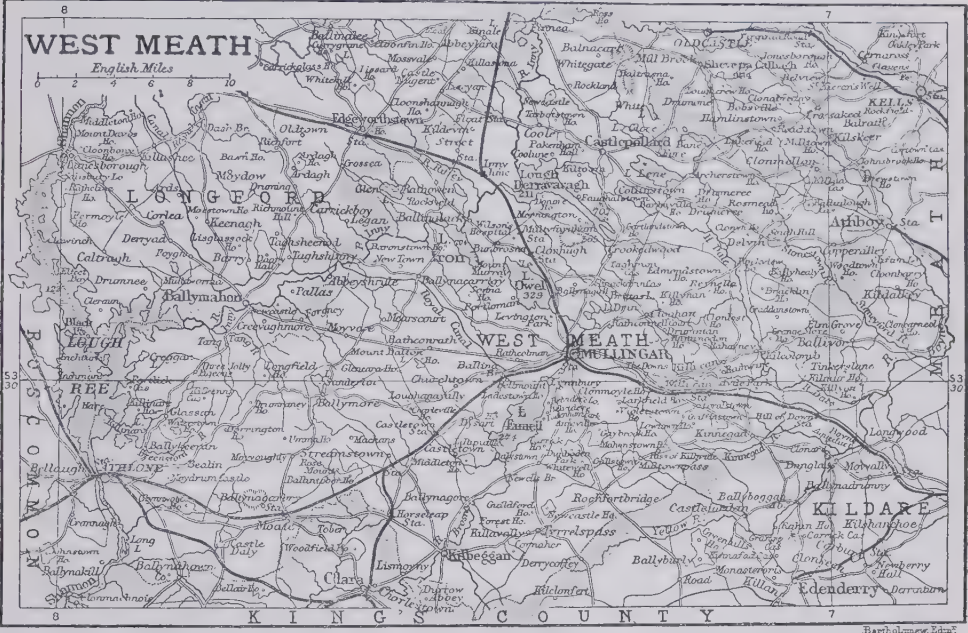
Westminster, CITY OF, is the greatest of the twenty-eight boroughs which together form the county of London. (See LONDON.) Under its original name of the Isle of Bramble or Thorn-ea, Westminster was a place of importance before London existed. The Saxon king Sebert (597-616) built a monastery on the site now occupied by the abbey. Offa (700) is said to have had a 'king's house' there. King Canute the Dane (1017-35) began the building of what became the palace of Westminster, in which the sovereigns of England held their court for five hundred years, and Edward the Confessor (1042-66) rebuilt Sebert's monastery on a scale of great magnificence. This new house he called West Minster, by which name both the abbey and Thorn-ea have since been designated. Henry III. (1216-72) pulled the minster down, and, for the purpose of doing honour to the Confessor's memory, began the erection of a more splendid building, which was completed by Edward I. (1272-1307) and succeeding sovereigns. The abbey, indeed, as it has come down to us, represents the work of something like five hundred years. But while the glorious West Minster has been preserved, all that now remains

of the palace begun by Canute is the beautiful hall built by William Rufus (1097), in which Charles I. was tried and condemned, and the crypt. The hall was repaired in 1397 by Richard II. The Houses of Parliament, Westminster Hall, and New Palace Yard now cover the site of this old palace. It had ceased to be used as a 'king's house,' however, in the reign of Henry VIII (1509-47), who moved the court to White Hall, which, as York Place, had been for 250 years the town house of the archbishops of York. White Hall was in great part destroyed by fire in 1691, and Inigo Jones prepared designs for a new palace. The Banqueting House was completed, and this was all that es-

house of the abbey, and for the next three hundred years in St. Stephen's Chapel, built by King Stephen (1135-54). The Houses of Parliament were burned down in October 1834, Westminster Hall and the crypt of St. Stephen's alone being saved. The present houses, erected from the designs of Sir Charles Barry, were seventeen years in building (1840-57). St. Margaret's Church stands close to the abbey. It is said to have been founded by Edward the Confessor. Westminster school, which in the 18th century was a rival of Eton, dates its origin from the time of Queen Elizabeth, though it is the immediate successor of a grammar school which was in existence before the reformation. The

le Grosvenor, came over in the train of the Conqueror. Robert, the first Marquis of Westminster (1767-1845), was son of the first Earl Grosvenor (d. 1802). He was succeeded by the second marquis, Richard (1795-1869), whose son, Hugh Lupus (1825-99), was created a duke (1874); and was succeeded, as second duke, by his grandson, Hugh Richard Arthur (1879), who was son of the first duke's deceased eldest son, Earl Grosvenor (1853-84).

Westminster Assembly of Divines, a body of 121 clergymen and 30 laymen, all representative of England, with 4 ministers and 2 laymen delegates from Scotland, who were appointed by the Long Parliament

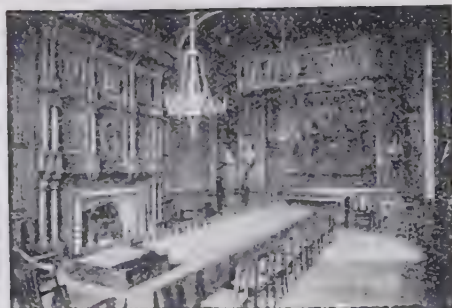
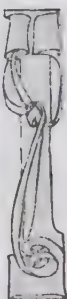
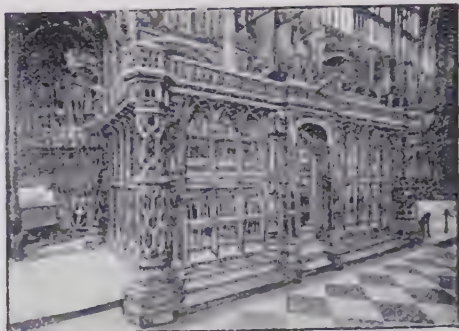
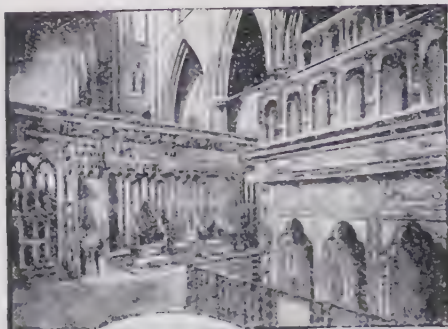


caped destruction in the second fire, in 1698, which reduced the remains of old White Hall to ruins. It was out of one of the windows of the Banqueting House that Charles I. stepped on to the scaffold. It is now used as a museum of historical relics. Two royal palaces still exist in Westminster—St. James's Palace, built by Henry VIII. in 1532; and Buckingham Palace, a comparatively modern structure. Kensington Palace, where Queen Victoria was born, is just beyond the limits of Westminster. Parliament was first called to Westminster in the reign of Edward I., and there it has continued to sit till the present time. The Commons met for three hundred years in the chapter

schoolroom was formerly the abbot's dormitory. The first printing-press used in England, Caxton's, was set up in Westminster, within the abbey precincts. Some of the greatest figures in English literature, and many of those who played a prominent part in the country's history, lived in Westminster. The chief government offices, the National Gallery, the Tate Gallery of British Art, and the National Portrait Gallery are among the principal modern buildings in the city of Westminster.

Westminster, DUKES OF. This noble house traces its descent in the male line to a Norman family. The founder of the English Grosvenors, Gilbert

to decide what form of doctrine and church government should be followed in England and Scotland. The Assembly sat from July 1, 1643, to Feb. 22, 1649. Among the most celebrated of its clergy were Ussher, Twisse, Burges, Goodwin, Salamy, with the Scotsmen Henderson and Rutherford; while among the laymen were Selden, Vane, Rouse, Pym, and Prideaux, with the Scots representatives, John Earl of Cassilis, John Lord Maitland, and Sir Archibald Johnston of Warriston. After affirming the Solemn League and Covenant, the Assembly accepted the resolutions regarding (1) the Directory of Worship; (2) the Confession of Faith; (3) the Shorter



Views in Westminster Abbey.

1. The Confessor's shrine and coronation chairs. 2. Tomb of Henry VII. 3. West front of Abbey. 4. The Chapter House. 5. Tomb of Queen Elizabeth. 6. The choir. 7. Poets' Corner. 8. Statues of statesmen. 9. The Jerusalem Chamber. (Photos 1, 2, and 4, by H. N. King; 3, by Valentine; 5, 7, and 8, by Frith; 9, by G. W. Wilson & Co.)

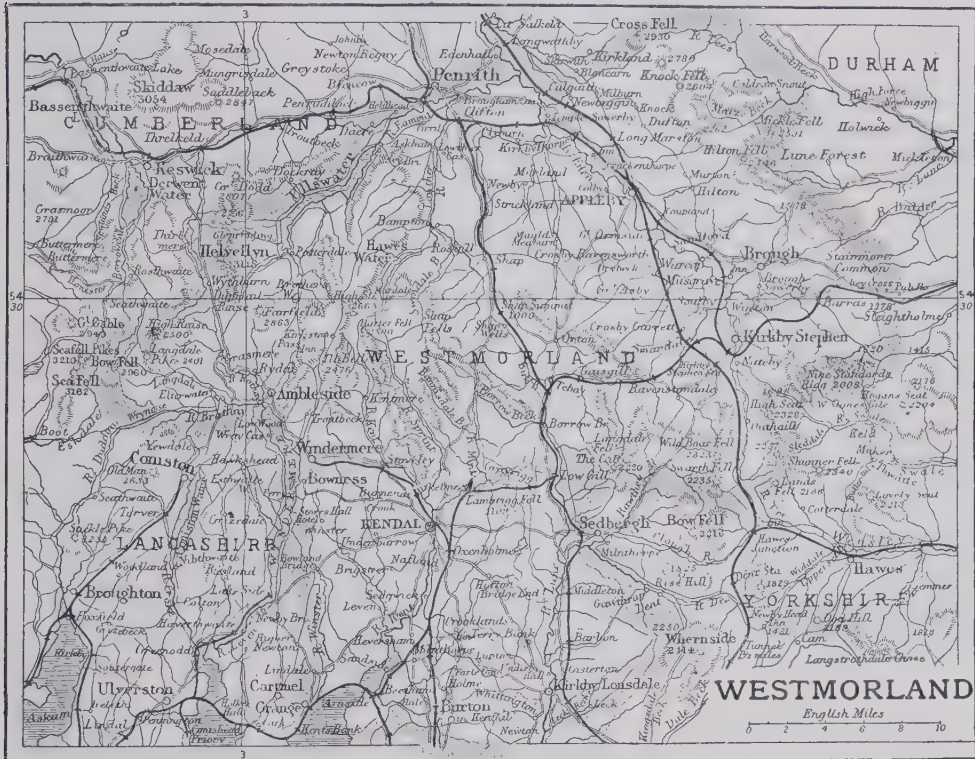
and the Larger Catechism. The tenor of the conclusions arrived at was strongly Calvinistic, and inclined towards the Presbyterian system of ecclesiastical polity. See Dr. Hetherington's *History of the Westminster Assembly* (ed. 1891), and Mitchell's *Westminster Assembly* (1883).

Westminster Gazette, THE, was founded in 1893 by Sir George Newnes, the proprietor of *Tit-Bits*, to supply the demand for a Liberal evening paper of the class of the earlier *Pall Mall Gazette*. Mr. E. T.

are the Eden, N.E.; Lune and Kent, S. On the w. border are Ullswater and Derwentwater; and within the county, Windermere, Hawes Water, Grasmere, and Rydal Water. Cattle and large numbers of sheep are pastured. Gypsum, granite, slate, and limestone are quarried, and some lead is mined. Woollen goods are manufactured. The county returns two members to Parliament. Area, 505,330. Pop. (1901) 64,409.

Weston, EDWARD (1850), English electrician, went to the United States (1870) as chemist

Hesse-Nassau, the Rhine Province, and Holland. The greater part of the surface is hilly, the Weser Mts. and the Teutoburger Forest in E., and Sauerland Mts. and Westerwald in the S.; the remainder belongs to the N. German plain. The province lies generally on the watersheds between the Weser, Rhine, and Rhine. It possesses vast deposits of coal in the basin of the Ruhr, and produces from 30 to 50 million tons annually. Iron is mined to over a million tons annually; and zinc, lead, copper, pyrites, salt, anti-



Bartholomew, Edm.

Cook, late editor of the *Pall Mall*, became the first editor of the *Westminster*, and with him went Mr. (now Sir) F. Carruthers Gould, whose well-known cartoons have become a distinctive feature of the *Westminster*. When Mr. Cook retired (1895) he was succeeded by Mr. J. A. Spender.

Westmorland, N. co. England, E. of Cumberland, and forming part of Lake district. The surface is mountainous, with tracts of moorland N.E. and N. Many summits exceed 2,000 ft.; highest in N.E. (Crossfell, 3,000 ft.; Millbourne Forest, 2,780 ft.; Knock Fell, 2,604 ft.). The chief rivers

to the American Nickel-plating Co., for which he invented many new instruments, especially dynamo-electric machines, erecting a factory at Newark for their production in 1875. This was subsequently amalgamated (1881) with the U.S. Electric Lighting Co.

Weston-super-Mare, wat.-pl., Somerset, England, on Bristol Channel, 20 m. S.W. of Bristol, at the base of Worlebury Hill, crowned by an ancient camp. It has a marine esplanade, piers, pavilions, swimming-baths, and golf links. Pop. (1901) 19,845.

Westphalia, prov. in the W. of Prussia, between Hanover and

money, and quicksilver are also extracted. Iron and steel, tin, bronze, brass, Britannia metal, and similar industries, are carried on on a vast scale at Bochum, Dortmund, Hagen, Iserlohn, Altena, Siegen, Lüdenscheid, and other towns. In fact, the district around Dortmund is one of the busiest hives of human industry on the Continent. Other industries include linens (Bielefeld, Herford), leather, glass, cottons, paper, chemicals, sugar, pottery, tobacco. Agriculture also stands at a relatively high level. The breeding of cattle and horses is important. West-

phalia produces noted hams. Cap. Münster. Area, 7,800 sq. m. Pop. (1900) 3,187,777. The province had no corporate political history previous to its crea-

Westport, seapt. tn., on w. coast of South Island of New Zealand, 145 m. s.w. of Nelson. Exports gold and coal. Pop. (1901) 2,921.



Westphalia.

tion in 1815, out of a great number of minor territories. The treaty of Westphalia, which wound up the Thirty Years' war, was signed at Münster in 1648.

The kingdom of Westphalia, which lasted from 1807 to 1813, was created by Napoleon and bestowed upon his brother Jerome. It embraced a large part of Low Germany between the Elbe and the Rhine—i.e. north-west of a line drawn from the Main to the Havel, and amounting to an area of 14,625 sq. m., and a population of approximately 2,000,000. Its capital was Cassel. In 1810 it was enlarged by the addition of Hanover, giving another 9,950 sq. m. and 650,000 inhabitants; but in 1812 the whole of the northern regions from the Elbe near Lüneburg to Wesel on the Rhine were incorporated in France, thus reducing its area to 17,535 sq. m., and its population to 2,066,000.

West Point, military academy of the United States, in New York State, on r. bk. of Hudson R., 8 m. N. of Peekskill. The average number of cadets is 300.

Westport, mrkt. tn. and seapt., Co. Mayo, Ireland, with port on Clew Bay; a favourite seaside resort. It has considerable trade in agricultural produce and provisions. Beer and mineral waters are manufactured. There is weekly steamer communication with Glasgow and Liverpool. Pop. (1901) 3,892.

West Prussia. See PRUSSIA, WEST.

Westrumite, a road-dust preventing material, which has for

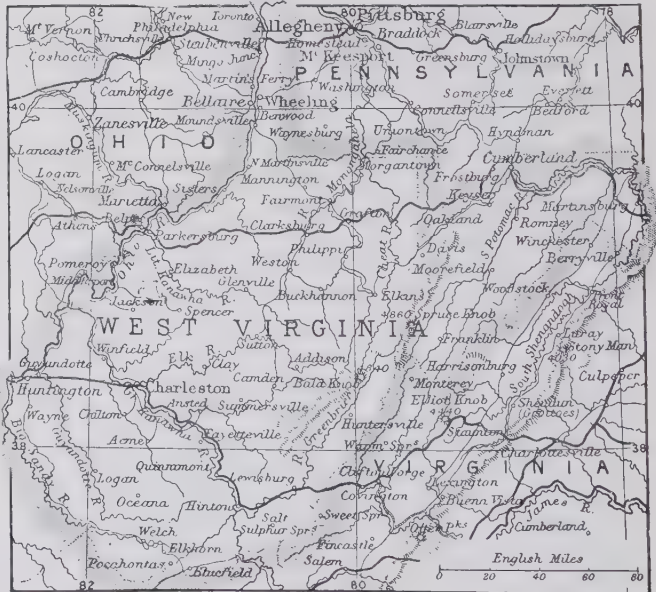
sively used by county and borough councils and other municipal authorities in order to minimize the objectionable and harmful dust-raising tendency of cars.

West Troy. See WATERVLIET.

West Virginia, an eastern state of the United States of America, with an area of 24,780 sq. m. It was admitted in 1863, during the civil war, its area being taken from Virginia. It lies almost entirely on the Alleghany plateau (4,000 ft.), and stretches down to the Ohio R., being drained by the Monongahela, Kanawha, Big Sandy, and smaller streams. Except where cleared for cultivation, the land is covered with forests. The capital is Charleston, but the largest and most important city is Wheeling. Apart from mining, the chief industry is farming. West Virginia also produces iron and steel, lumber and flour. The mineral wealth consists of iron, coal, petroleum, and natural gas. Pop. (1900) 958,800, of whom the foreign-born numbered 22,451, or 2.3 per cent.; and negroes, 43,499, or 4.4 per cent.

Westward Ho, wat.-pl., Devonshire, England, on Bideford Bay, 2½ m. N.W. of Bideford; named after Charles Kingsley's novel. The United Service College was established here in 1874.

Westwood, JOHN OBADIAH (1805-93), English entomologist



West Virginia.

its main ingredients petroleum and ammonia. With the spread of motoring, it has been exten-

and palaeographer, was born in Sheffield. One of the founders of the Entomological Society

(1833), he became Hope professor of zoology at Oxford (1861). His works include *British Butterflies* (1841) and *British Moths* (1843-5); and he edited *The Utrecht Psalter* (1874), and *The Book of Kells* (1887).

Wet, DE. See DE WET.
Wetherell, ELIZABETH. See WARNER, SUSAN.

Wette, DE. See DE WETTE.
Wetter, LAKE. See VETTER.
Wetterhorn, Alpine peak, rises E. of the Grindelwald valley in Switzerland, in the Bernese Oberland range. It is composed of three summits—the Mit-

telhorn (12,166 ft.), first climbed in 1845 by Speer, a Scotsman; the Hasli Jungfrau (12,149 ft.), first ascended in 1844 by two Hasli guides, but its ascent from Grindelwald by Mr. Justice Wills in 1854 is generally taken as the date of the commencement of modern mountaineering; the Rosenhorn (12,110 ft.), first attained in 1844 by Desor's party. An aerial mono-rail, to the height of over 7,700 ft., is expected to be ready for traffic this year (1906).

Wettin, HOUSE OF, a German dynastic family from which the reigning Saxon lines are descended. The ancestor is one Teti, a count in the Saale valley in the middle of the 10th century. Towards the end of the 11th

century Henry of Wettin added Lusatia and the mark of Meissen to the family dignities, and henceforth the Wettins held a very influential position in the empire. Naumberg was the capital of their dominions. Eventually the mark of Meissen grew into the electorate, later into the kingdom of Saxony. Wettin was the surname of Prince Albert, and is that of the present reigning royal family of the United Kingdom. See Hofmeister's *Das Haus Wettin* (1889).

Wetzer, HEINRICH JOSEPH (1801-53), German theologian,

hilly in N. and W., with Mt. Leinster (2,610 ft.), Blackstairs Mts. (2,409 ft.), and others on W. border. Among the principal inlets are Wexford Harbour and Bay, E.; and Waterford Harbour, S. Dangerous sand-banks occur off the E. coast; S.E. is Tusker Rock, with lighthouse; and S. the Saltee Is. Rivers are Barrow on W., navigable for large vessels to New Ross; and Slaney, navigable for barges to Enniscorthy. Nearly one-third of the surface is under tillage. Marble is quarried. The county returns two members to Parliament. Area, 901 sq. m.



The Wetterhorn.

born at Anzefahr in Hesse, and was appointed professor of Oriental philology at Tübingen (1830). He collaborated with Welte in the compilation and publication of the *Kirchen-Lexikon der Katholischen Theologie* (12 vols. 1846-60), a new edition of which was prepared by Hergenröther and Kaulen (1882, etc.).

Wetzlar, tn., Rhine Province, Prussia, on the Lahn, 33 m. N.N.W. of Frankfort-on-Main; has manufactures of gloves, optical instruments, and chemicals. Iron is mined. Goethe lived here in 1772, and makes it the scene of his *Sorrows of Werther*. Pop. (1900) 8,906.

Wexford. (1.) Maritime co., prov. Leinster, S.E. Ireland. It is

Pop. (1901) 104,104. (2.) Municipal bor. and seapt., cap. of Co. Wexford, Ireland, on the Slaney, 15 m. S.E. of Enniscorthy. It has whisky-distilling, brewing, malt works, iron foundries, hat factory, and lime and cement works, and important fisheries. The harbour formed by the estuary of the Slaney is obstructed by a bar, but accommodation for large vessels is being provided at Rosslare, 7 m. S.E. Pop. (1901) 11,168.

Wexio. See VEXIO.

Weyden, ROGIER VAN DER (1400-64), Flemish artist, born at Tournai. He settled in Brussels (1435), and was shortly thereafter appointed painter to that town. In 1449 he visited Rome, Milan, and Florence. Among his best-

known works are *The Descent from the Cross*, *The Expulsion of Adam and Eve from Paradise*, and several representations of the *Virgin and Child*. See *Life*, in French, by Wauters (1856).

Weyland. See **WAYLAND**.
Weyler y Nicolau, VALERIANO, MARQUIS OF TENERIFE (1839), Spanish statesman, born at Palma in Majorca. The sever-

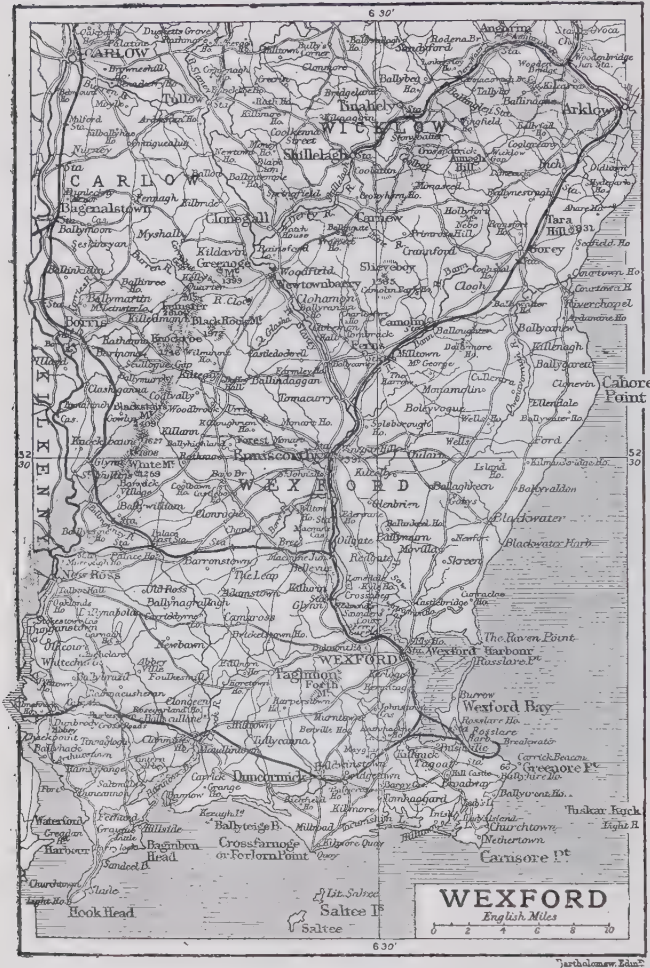
barrister (1881). He has published *The House of the Wolf* (1889), *A Gentleman of France* (1893), *Under the Red Robe* (1894), *My Lady Rotha* (1894), *The Red Cockade* (1895), *The Man in Black* (1896), *The Castle Inn* (1898), *Count Hannibal* (1901), *In King's Byways* (1902), *The Long Night* (1903), *The Abbess of Vlaye* (1904), and *Starvecrow Farm* (1905).

folk co., Massachusetts, U.S.A., 12 m. s.s.e. of Boston; has wool-scouring and manufacture of boots and shoes. Pop. (1900) 11,324.

Weyprecht, KARL (1838-81), Arctic explorer, born at König in Hesse-Darmstadt. After serving in the East and in N. America, he conducted (1871-4) an expedition to the North Pole on board the *Tegetthoff*, which resulted in the discovery of Franz Josef Land. His principal works were *Die Metamorphosen des Polareises* (1878) and *Praktische Anleitung zur Beobachtung der Polartreiber* (1881). See *Littrow's Karl Weyprecht* (1881).

Whale, a general name applied to all the larger members of the Cetacea, which are divided into the two suborders of the whalebone whales and the toothed whales. One of the most striking characters of the former is the presence in the mouth of the plates of baleen, the substance popularly called whalebone. Baleen is not bone, but a substance of similar composition to horn, and is characterized by its flexibility and elasticity. The baleen apparatus of the whalebone whales is made up of a large number of flattened plates, which hang down freely in the mouth cavity. Their function is to strain from the water the small organisms upon which the whales feed. The whalebone whales are further characterized by the very loose attachment of their ribs to the backbone, so that the chest can be greatly expanded. This permits the whale to remain a long time under water without coming up to breathe. After birth teeth are completely absent; but the fact that rudimentary teeth are present before birth shows that these whales are descended from ancestors in which teeth were present. Existing whalebone whales belong to the following genera: *Balæna*, including the right whales; *Balænoptera*, including the fin-whales or rorquals; *Megaptera*, including the humpback whale; *Rhachinaeetes*, including the gray whale of the Pacific; and *Neobalæna*, including the rare pigmy whale of southern seas, whose whalebone is very valuable. The gray whale (*R. glaucus*) attains a length of over forty feet, and has short yellow whalebone. The humpback (*M. boops*) is remarkable for the great length of its flippers.

In the toothed whales there is no whalebone, and teeth are present; there are also several anatomical distinctions from the whalebone whales. Important toothed whales are the cachalot, the bottlenose, the beluga, the grampus, the narwhal, the beaked whales (*Mesoplodon*), and the dolphin and porpoise. Very many



ity with which he stamped out revolt in certain parts of Cuba caused other parts to rebel, and induced the Spanish-American war. He conducted successful campaigns in Cuba (1868-72), against the Carlists in Northern Spain (1875-76), and in Mindanao (Philippines).

Weyman, STANLEY JOHN (1855), English historical novelist, born at Ludlow; became a

Weymouth. (1.) Municipal bor., seapt., and wat.-pl., Dorsetshire, England, 8 m. s. of Dorchester, at the mouth of the Wey. A bridge connects with Melcombe Regis, on the N. (included in the borough), with esplanade stretching along Weymouth Bay. The Nothe, a promontory with fort, separates the harbour from Portland Bay. Westham is a suburb. Pop. (1901) 19,843. (2.) Town, Nor-

of these are hunted for their oil, a product also yielded by the whalebone whales. See *Cetacea*, by W. N. Lockington (1888); Gray's Brit. Mus. Cat. of *Seals and Whales* (1866-71); Flower and Lydekker's *Mammals* (1891).
Whale, THE, a poem of between eighty and ninety lines

Whale - louse (*Cyanus*), a genus of amphipod Crustacea, whose members are parasitic on the skin of whales. The body is broad and flat, and corresponds to the thorax of other Crustacea, the abdomen being rudimentary. There are four pairs of clawed limbs, by means of which the ani-

1640 was one of the commissioners for the trial of Charles I., and signed the death-warrant. He attached himself to Cromwell, and was one of the major-generals (1655) through whom Cromwell governed. At the restoration a price was set on his head, but he escaped to New England.

Wharfe, riv., Yorkshire, England, rises on Cam Fell, and flows S.E. to the Ouse near Cawood. Wharfedale is noted for its beautiful scenery. Length, 60 m.

Wharnccliffe, JAMES ARCHIBALD STUART WORTLEY MACKENZIE, FIRST BARON (1776-1845), British politician, became a member of the House of Commons in 1797. He was a moderate Tory, supporting the Liverpool ministry, urging economy in administration, and holding that protection to agriculture had gone far enough. In Peel's administration he was president of the Council (1841-5).

Wharnccliffe Meeting, a meeting of a company held in compliance with Standing Orders 62 to 66 of both houses of Parliament, to obtain the consent of the proprietors to a private bill which is either promoted by the company, or confers upon it powers to do any act which is not authorized by its existing powers. The Standing Orders were first made by the House of Lords in 1858, at the instance of Lord Wharnccliffe, and, *mutatis mutandis*, they were adopted by the House of Commons.

Wharton, GRACE (? 1790-1862), the *nom de plume* of Catherine Byerley (her married name being Thomson), who achieved a literary reputation through her historical monographs on *Raleigh* (1830); *Sarah, Duchess of Marlborough* (1838); *The Duke of Buckingham* (1860); *Memoirs of the Jacobites* (1845-6); and, in conjunction with her son, *Queens of Society* (1860), and *Wits and Beaux of Society* (1860).

Wharton, PHILIP WHARTON, DUKE OF (1698-1731), Irish politician and orator. By his eloquence he so served the government that he was rewarded with an English dukedom (1718), and in the British House of Lords he became a conspicuous opponent of the administration. His manner of life was extravagant, and in 1724 he found it convenient to travel on the Continent, where he became entangled with the Pretender; and in 1727 so far forgot himself as to fight with the Spaniards against his own countrymen at Gibraltar. He was in absence convicted of high treason, and spent the remainder of his life in debauchery in France and Spain. See *Life and Writings of Philip*, late Duke of Wharton (2 vols. 1732).



Species of Whales.

1. Greenland whale. 2. Common porpoise or fin fish. 3. Humpback whale. 4. Sperm whale. 5. Pilot whale. 6. Beluga or white whale. 7. Narwhal. 8. Grampus (attacking Greenland whale).

in the *Exeter Book*, forms part of the Old English *Physiologus*. The old story of the sailors mistaking the whale for an island, familiar in *Sindbad the Sailor*, and furnishing Milton's well-known simile in *Paradise Lost*, i. 203, is found here.

Whalebone. See **WHALE**.

mals attach themselves to their host, and two pairs of gills. The whale - lice are allied to the skeleton-shrimps (*Caprella*).

Whalley, EDWARD (d. 1675), English regicide, was born at Stanmore in Sussex. On the outbreak of the civil war he joined the parliamentary forces, and in

Wharton, THOMAS WHARTON, MARQUIS OF (1640-1715), British politician, was brought up in the strictest sect of the Puritans, but the emancipated precisian managed to astonish even the restoration observers. About 1679 he became interested in politics, in which he was very successful as a

Wharton's Duct, the duct leading from the submaxillary gland into the mouth, and opening under the tongue through a papilla at the side of the fold of membrane that joins the tongue and the floor of the mouth.

Whately, RICHARD (1787-1863), archbishop of Dublin, was born

in politics and religion, one of the founders of the Broad Church school, and strongly in favour of unsectarian religious education. Among his numerous writings were *Logic* (1826), *Rhetoric* (1828), *Historic Doubts Relative to Napoleon* (1819), *Essays on the Peculiarities of the Christian Religion* (1825), *Christian Evidences* (1837), *The Kingdom of Christ* (1841). See *Life and Correspondence* (1866) by his daughter, and *Memoirs* by W. J. Fitzpatrick (1864).

Wheat is a true grass, and belongs to the genus *Triticum*. The inflorescence, or ear, is a true grass spike, consisting of spikelets arranged upon a rachis. At the base of each spikelet are two empty, boatlike glumes, within which are from two to eight florets, which when fertile contain one grain or 'berry' each. Like all grasses, wheat first appears as a single blade, and is therefore monocotyledonous, and is endogenous in its development. Cultivated wheat is an annual, unknown in the wild state; neither is there any grass which can be regarded as its parent form. It has been found in prehistoric lake dwellings, and was cultivated by the ancient Chinese and Egyptians. The Romans introduced it into Britain. The origin of wheat is discussed in Darwin's *Animals and Plants under Domestication*; but we are left in doubt as to whether it was derived from a wild plant, subjected to cultivation and gradual improvement, or whether it was a natural production. Dr. Candolle inferred that its natural home was Mesopotamia.

A useful arrangement of the various cultivated wheats is as follows: — *Triticum sativum*, common wheat, of which there are numerous varieties; *T. turgidum*, including cone and other turgid wheats; *T. durum*, hard wheat; *T. polonicum*, Polish wheat; *T. amyleum*, starch wheat; *T. monococcum*, a single grain in each floret; *T. spelta*, spelt, said to have been the cultivated wheat of the Romans. Haeckel recognizes only the first, fourth, and sixth of the above as species, and the others as varieties only. *T. sativum* and *T. turgidum* are both cultivated in Great Britain, but the latter in small quantity, chiefly as Rivett's and other cone wheats. The cone wheats are soft and coarse, bearded, and rough-chaffed. They yield heavy crops of both grain and straw, and comprise the so-called 'mummy' wheat. *T. sativum* or *vulgare* is by far the most extensively grown wheat, and has shown itself capable of producing any number of varieties. Major Hallet first drew attention to pedigree



Varieties of Wheat.

1. Square heads (master). 2. *Triticum sativum* (Talavera). 3. *T. monococcum*. 4. *T. compositum* (mummy wheat). 5. *T. spelta*. 6. *T. polonicum*. 7. *T. turgidum*. (Spikelet of each of 2 to 7 shown separately.)

party manager. He acted with the Whig party, corresponded with the Prince of Orange, and is reputed to have written *Lillibullero*, which did more against James II. than all his politics. In 1708 he became lord-lieutenant of Ireland—a post which he held till 1710.

in London, and became a fellow (1811) of Oriel College, Oxford. In 1821 he was appointed to the living of Halesworth; was Bampton lecturer (1822); principal of St. Alban Hall, Oxford (1825); professor of political economy (1829); and archbishop of Dublin (1831). Whately was a Liberal

cereals. One of the chief economic differences in wheats is evidently the result of climate. The hard wheats of India and of other tropical countries are extremely dry and rich in gluten; whereas the wheats grown in Great Britain and Europe contain rather more moisture, and are richer in starch. These two classes of wheat are blended to produce a mellow flour.

Wheat may be cultivated in all latitudes, from the tropics almost to the limits of the temperate zone; but it is best suited for soils of argillaceous character. The yield of wheat per acre varies according to climate and cultivation. In several of the United States an average of only 9 or 10 bushels per acre is looked for. The average yield in France is about 15 bushels, in England 30 bushels, and in Canada from 20 to 40 bushels. Maximum crops in England reach 60 bushels or more in the south-eastern counties.

Wheat, DISEASES OF. See RUST FUNGI, SMUT, HESSIAN FLY.



Wheatear.

Wheatear (*Saxicola cyananthus*), one of the chats, is a frequent summer visitor to Britain, where it also occasionally occurs in the winter. The male is grayish blue above, with a black streak at the side of the head, the wings are nearly black, the rump white, the tail black and white, the under surface white, with a tinge of buff. The wheatear has a very characteristic mode of flitting about, when it constantly displays the white rump. The food consists of insects, and the bird is common both on moorlands and near the sea. The nest is placed in a great variety of situations, often in a rabbit-burrow or in a crevice of a stone wall. The song is sweet, and the bird has some power of mimicry. The genus includes not a few other species — e.g. the desert wheatear (*S. deserti*), the black-throated wheatear (*S. stapazina*), and the Isabelline wheatear (*S. isabellina*).

Wheat Fly. See HESSIAN FLY.

Wheatley, HENRY BENJAMIN (1838), author, assistant secretary to Society of Arts since 1879; was clerk to the Royal Society (1861-79), honorary secretary and treasurer of the Early English Text Society (1864-1903). His publications include *Round about Piccadilly and Pall Mall* (1870), *What is an Index?* (1879), *Samuel Pepys and the World he lived in* (2nd ed. 1880), *London Past and Present* (1891), *Literary Blunders* (1893), *Reliques of Old London* (1896-9), *Historical Portraits* (1897), *Prices of Books* (1898), and *Pepysiana* (1899). He has also edited a new edition of *Pepys's Diary* (9 vols. 1894-9).

Wheaton, HENRY (1785-1848), American jurist and diplomatist, born at Providence, Rhode I.; was called to the bar (1805). He edited *The National Advocate* (1812-15); was reporter (1816-27) for the United States Supreme Court; *chargé d'affaires* to Denmark (1827-35); and minister at Berlin (1835-46). Among his works are *A Digest of the Law of Maritime Captures* (1815), *Life of William Pinkney* (1826), *History of the Northmen* (1831), *Elements of International Law* (1836; 4th Eng. ed. 1904), and *History of the Law of Nations in Europe and America* (1845).

Wheatstone, SIR CHARLES (1802-75), English electrician, was born near Gloucester. His first researches were in connection with sound. In 1834 he became professor of experimental philosophy at King's College, London, and in 1837 took out patents for an instrument for giving signals by electricity, which has grown into the telegraph. In 1838 he invented the stereoscope, and in 1843 instruments for measuring the constants of a voltaic series. Wheatstone's bridge for measuring electrical resistance he did not invent, but only brought into public notice. His *Scientific Papers* were published in 1879.

Wheatstone Bridge. See ELECTRIC TESTING.

Wheel and Axle. This consists of a wheel secured to a coaxial shaft. When this simple machine is used for raising heavy weights, the string supporting the load is wrapped round the axle, whilst that by which the power is applied is coiled round the wheel. (Fig. 1.) If assumed frictionless, the principle is shown by applying the equation of work. Let P and w be the effort and the load respectively, and let r and τ be radii of the wheel and of the axle, and imagine one complete turn to be given. w rises a distance $2\pi r$, and P descends $2\pi \tau$; hence $Pr = w\tau$. If pounds and feet be the units, this equation repre-

sents moments, expressed in pound-feet. By considering the end elevation (Fig. 2) it is easily seen that the machine behaves as

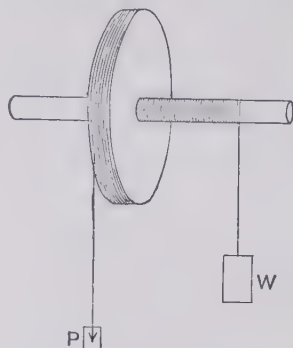


FIG. 1.

if it were a lever AB of the first class turning about F . Hence $P \times AF = W \times FB$, or $P \times r = w \times \tau$. If the wheel be replaced by a handle, the machine becomes a windlass; the addition of a jib and stay and a little extra gearing make it into a crane.

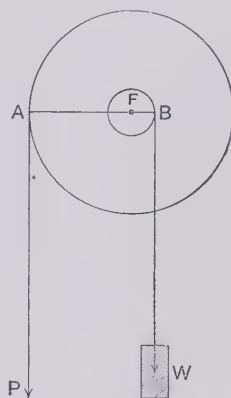


FIG. 2.

Wheel Animalcules. See ROTIFERA.

Wheel Base, the distance between centres, from extreme front to extreme back wheel, of locomotive or car.

Wheeler, JOSEPH (1836-1906), American general, born at Augusta, Georgia. He served through the civil war on the Confederate side; commanded the cavalry division in Cuba, and was prominent in the capture of Santiago (1898), negotiating the surrender of the Spanish army. He saw further service in the Philippines (1899-1900), and became brigadier-general (1900). He wrote *Cavalry Tactics* (1863); *Account of Kentucky Campaign*

(1862); *History of the Santiago Campaign* (1898); *History of Cuba, 1496-1899* (1899); *History of the Effect upon Civilization of the Wars of the 19th Century*; and *Lives of Dewey, M'Kinley, Stonewall Jackson, and Roosevelt*.

Wheeler, WILLIAM ALMON (1819-87), American legislator and vice-president of the United States 1877-81, was born at Malone, New York, and called to the bar in 1845. He occupied a seat in Congress for New York, from 1869-1877. He will be remembered for 'the Wheeler Compromise' (1875), whereby the government of Louisiana was settled. He was nominated to serve with President Hayes by the Republican party (1877-81).

Wheeling, city, W. Virginia, U.S.A., co. seat of Ohio co., 47 m. s.w. of Pittsburgh, on the Ohio; manufactures principally iron and steel. Pop. (1900) 38,878.

Wheel-lock. See GUNS.

Wheels, REACTION, PELTON, WATER. See HYDRAULIC MACHINERY.

Whelk, a name applied to a number of marine carnivorous gastropods, though it should be restricted to the species of *Buccinum* and *Fusus*. The common whelk of British waters is *B. undatum*, called 'buckie' in Scotland, which burrows in mud and sand from low water to considerable depths. It is both used as bait and sent to the London market for food. The shell has few whorls, is spirally grooved and striated, and has the surface marked with oblique transverse undulations. Allied to *Buccinum* is the genus *Fusus*, including the forms called spindle-shells, red whelks, or roaring buckies, which have markedly fusiform shells. The dog-whelk is the common *Purpura lapillus*, abundant everywhere between tide-marks; and the name is also applied to species of *Nassa*, of which *N. reticulata* occurs between tide-marks in abundance.

Whetstones. See HONES.

Whewell, WILLIAM (1794-1866), English philosopher, was born at Lancaster; graduated (1816) as second wrangler at Cambridge, and became a fellow of Trinity College. In 1828 he became professor of mineralogy, and from 1838-55 held the chair of moral theology. In 1841 he was elected master of Trinity, and in 1855 vice-chancellor of the university. His activity as a lecturer, preacher, writer, and administrator was prodigious, and his scope was enormous. 'Science,' said Sydney Smith, 'was his forte, omniscience his foible.' Among his works were *History of the Inductive Sciences* (1837), *The Philosophy of the Inductive Sciences* (1840), *The Elements of Morality*

(1855), and translations of foreign plays, philosophies, law books, and novels. See Todhunter's *Whewell* (1876), and *Life* by Mrs. Douglas (1881).

Whey. See CHEESE.

Whitchote, or WHITCHCOTE, BENJAMIN (1609-83), English divine and philosopher, was born in Shropshire, and elected a fellow of Emmanuel College, Cambridge, in 1633. He preached weekly sermons at Trinity Church, through which he exerted a powerful influence on the university for nearly twenty years. He held various livings and academic positions at Cambridge. Whitchote held the views of the Cambridge Platonists or Latitudinarians, who insisted on the supremacy of private judgment, and on the fundamental facts of religion, over the dogmas of Puritan orthodoxy. Among his writings are *Discourses*, in 4 vols. (1701-7), under title *Works* (1751); *Moral and Religious Aphorisms*, edited by Salter (1753). Complete edition of his *Works* (4 vols. 1751), by Campbell and Gerard.

Whidah. See WHYDAH.

Whig, the designation of a party in English politics, was, like many political names, first applied in derision. It is a shortened form of 'Whigamore,' a term applied to the Covenanted men of the south-west of Scotland (variously derived from *whig*, sour whey, and *whiggam*, a sound made by drivers to urge on their horses). The word seems to have been generally applied after the restoration to the whole Presbyterian party in Scotland, and later in England to all who were suspected of opposition to the king, or of sympathy with the nonconformists. The term became the designation of the party which made the revolution, and which, through the medium of the great Whig houses, ruled England till the time of George III. At the time of the Reform Act it was supplanted by the term Liberal. It is still used by English Radicals as a term of derision and criticism towards those members of the Liberal party who are not 'advanced' in their views.

In United States politics the term was first applied to the revolutionaries, as Tory was applied to the loyalists, and it was adopted later by the party which organized itself in opposition to the rather high-handed politics of President Jackson. But this new Whig party stood for no definite principles, and its policy of compromise in the face of the great slavery issue brought it into discredit. It was superseded by the Republican party. See Lord Holland's *Memoirs of the Whig Party* (1852-4), and *Further Memories* (1906).

Whimbrel. See CURLEW.

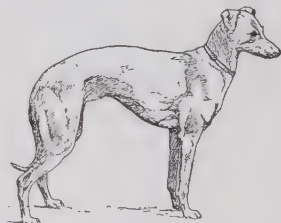
Whin. See FURZE.

Whinchat (*Pratincola rubetra*), a near ally of the stonechat, which it generally resembles in colour. It is only a summer visitor to the British Isles, wintering in Africa, and is found chiefly on warm sunny heaths where there is undergrowth, but also in grass meadows, whence its other name of grasschat. The food consists chiefly of insects.



Whinchat.

Whinstone, a name popularly applied in Scotland and the north of England to any tough, hard, dark-coloured rock not easily recognizable as a sandstone, a limestone, or a shale. Most of them are coarsely crystalline diabases or dolerites, or finer-grained porphyritic basalts; others are varieties of andesite, trachyte, or diorite.



Whippet.

Whippet, the result of a cross between the terrier and the Italian greyhound; it varies in weight from 10 lbs. to 25 lbs. It is the favourite dog with miners in the north of England, who use it for racing. It is also used for coursing rabbits. Points of the whippet:—Head long and lean, rather wide between the eyes and flat on the top; jaw powerful, yet cleanly cut; teeth level and white; eyes bright and fiery; ears small, fine in texture, and rose-shaped; neck long, muscular, elegantly arched, and free from throatiness; shoulders oblique and muscular; chest deep and capacious; back broad and square, rather long and slightly arched over loins, which should be strong and powerful; fore legs rather long, well set under, and

with fair bone; hind quarters strong and broad; stifles well bent; thighs muscular; hocks well let down; feet round, well split up, with strong pads; tail long, tapering, and nicely carried; coat fine and close; colour black, red, white, fawn, brindle, blue, and mixtures of the same.

Whipping, a punishment inflicted in former times on persons below the rank of gentlemen for many minor offences, often 'at the cart's tail,' when the offender was tied behind a cart and whipped, while the cart proceeded at a foot's pace from one specified place to another. Thus Titus Oates was sentenced to be whipped from Aldgate to Newgate, and two days later from Newgate to Tyburn. In 1817 the public, and in 1820 the private, whipping of females was abolished. Under the Vagrancy Act, 1824, incorrigible rogues may be whipped; and under the Garrotters Act, 1863, a male person convicted of robbery with violence, or of garrotting with intent, may be once, twice, or thrice whipped with twenty-five strokes of a birch rod if under sixteen, or with fifty strokes of any other instrument if over that age. By the Whipping Act, 1862, which applies to the United Kingdom, an offender sentenced to whipping may not receive more than twelve strokes of the birch rod if under fourteen, nor may any offender be whipped more than once; and in Scotland no person above sixteen may be whipped for offences against person or property. By the Naval Discipline Act, 1866, seamen in the royal navy may be sentenced to forty-eight lashes, but no petty or non-commissioned officer may be so sentenced except for mutiny. Boys under eighteen may be caned or birched; but the practice has recently been suspended by the Admiralty for a year, as an experiment. Under the Prisons Act, 1898, in civil and military prisons corporal punishment may be ordered in cases of mutiny, but only on special inquiry.

Whip-poor-will (*Antrostomus vociferus*), a North American night-jar, receiving its name from its cry, which is loud and clear, and heard only at night. The bird is about ten inches long, and in appearance and habits resembles the other nightjars. The bristles at the base of the bill are an inch long and very stiff, and there is a narrow white collar, while the lateral feathers of the rounded tail are largely white. Farther to the south the whip-poor-will is replaced by another species called chuck-will's-widow (*A. carolinensis*).

Whip-snake. See DRYOPHIS.

Whirlpool, an eddy or vortex, produced by the meeting of two or more currents of water. Such phenomena are frequent along broken coasts and among islands. Poe's famous tale of the Maelstrom is pure imagination. The Maelstrom is simply a strong current off the coast of Norway, which becomes dangerous to small craft during the north-west winds of autumn and winter. Similarly, Charybdis was nothing more than a current which became dangerously strong under certain conditions of wind and tide.



A Whirlwind in Oklahoma.
(Photograph from nature.)

Whirlwind, a mass of air whose elevation is very much greater than its width, and which rotates rapidly round a more or less vertical axis. It is a purely local phenomenon, and does not last long. Whirlwinds usually spring up about ten or eleven o'clock in the morning, when the ground has been warmed by the solar rays. The lower air begins to ascend. As the inflowing currents move through too limited a space to be influenced by the earth's rotation, and as the irregularity of their flow prevents them from meeting at a common centre, they deviate a little to one side or the other, and a small gyrating column is developed. This may rise eventually to a height of several hundred or even a thousand feet. At this elevation it spreads out laterally, and the supply of warm air being soon exhausted, the whirl quickly disappears. The dimensions are very variable, ranging from a harmless eddy in a dusty road to the terrific tornado of the United States. Whirlwinds are rarely experienced in the British Isles. One of the most destructive was that which passed over part of Kent,

between Walmer and Deal, on Oct. 24, 1878, known as the 'Walmer whirlwind.' See Symon's *Monthly Meteorological Magazine*, vol. xiii.

Whisky, a grain spirit obtained from malted barley or other cereal. (For malting and brewing, see BREWING.) Peat fires are often used in the Scotch kilns for drying and curing the malt; hence the peat flavour of some Highland and west country whiskies. After mashing, the wort is drained off from the draff, or spent grains, into an under-back, and allowed to settle for a short time, then cooled as rapidly as possible to about 70° F. to prevent it from becoming 'blinked' or soured. The wort contains carbohydrates, ash, albuminoids; it must therefore be quickly pitched with yeast, otherwise bacterial action may set in, and hinder a successful alcoholic fermentation. When fermentation is over, the resultant alcoholic liquid is termed 'wash.' The distiller aims at obtaining a wash of as low a gravity as possible—it generally runs about 1.004. The object of distilling the wash is to separate bodies which assume the form of vapour at a low temperature from those which require a higher, or from such as do not vaporize.

It is necessary to distinguish between genuine whisky made by pot stills and grain whisky made by patent stills, such as the 'coffeey,' in which the whisky is so pure as not to betray the origin of the spirit. Much of the ordinary whisky of commerce is a blend composed of a small quantity of pot-still whisky and a large quantity of the patent-still spirit. The pot still consists of a copper still or kettle, fitted with a pear-shaped head or capital, with or without a fractionating apparatus, and a copper worm which runs through a large tub of cold water. The first or wash still has a capacity of from 4,000 to 7,000 gallons, while the inside is furnished with a mechanical stirrer, in order to prevent the solid particles from charring on the bottom. The second or spirit stills average from 2,000 to 3,500 gallons. The wash is drained from the covered fermenting vats into a wash charger, and from this into the wash stills. A small quantity of tallow, rectified paraffin, or other body, is added to prevent frothing, and the distillation is started. The first product obtained is a weak alcoholic liquid known as 'low wines' or 'singlings.' These as vapours usually pass through a charcoal-box, and thence into the condensing apparatus. The residue, spoken of as 'pot' or 'burnt ale,'

is run to waste. It contains about 3 per cent. of solids. The low wines are run into the spirit stills, and again subjected to distillation. The products of this second distillation are foreshots, clean spirit or whisky, and feints; while left in the still are the 'spent lees,' which also are run to waste. The fore-

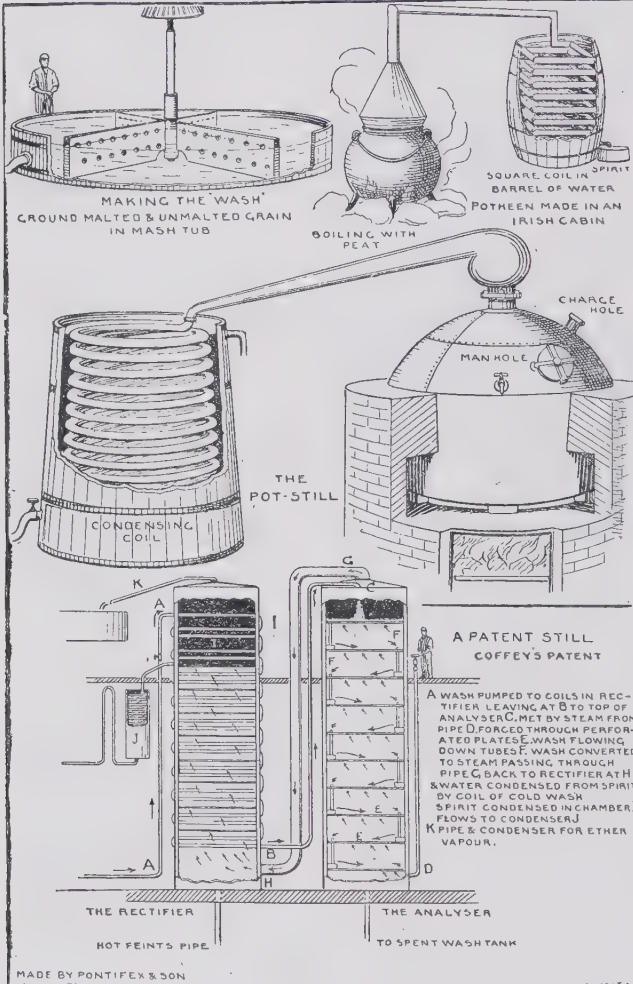
acids, esters, and furfural confer on this spirit its characteristics, and in the new whisky they cause the harsh, fiery, raw, and disagreeable flavour. The strength of pot-still whisky varies between 13° and 50° overproof (o.p.). In Scotland this is reduced to a uniform level of 11° o.p. before bonding, while Irish whisky is

The objects in using a patent still are a rapid distillation, and the production by one operation of a pure spirit. In these stills the analyzer separates the spirit, water, oils, and other volatile bodies from the wash, while the rectifier separates the spirits and aldehydes from the water and oils. The so-called 'silent spirit' obtained from patent stills varies but little in strength, the average being from 65° to 67° o.p. The new spirit thus produced is a colourless, mobile liquid, closely resembling spirits of wine in appearance. It possesses a disagreeable and often very nauseous flavour; but this disappears on storage in sherry casks for several years, or on being judiciously blended with other spirit. The specific gravity varies between 0.9148 and 0.9288; the amount of alcohol from 47 to 60 per cent. Total extract should always be under 1 per cent. The chief adulterant is potato spirit, containing much fusel oil. This, if present to a greater extent than 1½ grains per fluid ounce, is highly injurious to health.

During storage there is a considerable loss of spirit, especially in damp bonded stores. In the first year it amounts to 2.25 per cent. of proof spirit, in three years to 4 per cent., and in five years to 7½ per cent. The improvement by ageing continues for a number of years. There are several patent processes for ageing, but none are so effective as time.

Potteen, or potteen, is made in illicit stills—much of it from sugar and fermented molasses. Irish pot-still whisky is usually obtained from a mixed grist of malt and raw grain; grain whisky, from a mixed grist of barley, rye, maize, wheat, etc., and is a patent-still product. English whisky is a patent-still spirit, in which a small quantity only of malt is used. The grist is malted rye, ground oats, and maize. German whisky is also a patent-still spirit, in the preparation of which some forty-six different starchy materials are used. The question of whether patent-still spirit is entitled to the name of whisky or not is now before the courts, and is still (July 1906) undecided.

Whisky Insurrection. (1.) An outbreak in Western Pennsylvania in 1794, caused by an attempt on the part of the United States government to enforce the excise law (imposing taxes on distilled liquors) enacted by Congress (1791). (2.) Also an attempt made (1873-4), by the women of Southern Ohio and New York to prevent the sale of liquor.



Whisky-distilling.

shots and feints both give a milkiness when diluted with an equal volume of water. These are mixed with the next low wines and again distilled. Milkiness in the foreshots is caused by oily matter, and in the feints by the higher alcohols or fusel oils. Thus pot-still whisky must contain some small quantity of these bodies. The fusel oils,

bonded at 25° o.p. One hundred volumes of the Scotch spirit will contain 111 volumes of proof spirit, and 100 of the Irish will have 125 of proof spirit. Whisky, like brandy and rum, must not be retailed at a strength lower than 25° underproof (u.p.)—i.e. 100 volumes of the spirit must contain not less than 75 volumes of proof spirit.

Whist, a game of cards which originated in the 16th-century English game of triumph—corrupted into ‘trump.’ At the beginning of the 17th century it was known also as ‘ruff’ and ‘honours,’ and shortly afterwards as ‘whisk’ or ‘whisk and swobbers.’ Thirty or forty years later it assumed its present title of ‘whist,’ a term signifying ‘silence.’ Its practice was originally confined to the disreputable classes, but about the year 1730 it was taken up by a party of gentlemen, headed by Lord Folkestone, who met at the Crown Coffee House in Bedford Row, London, and they, with the aid of Edmund Hoyle, who gave lessons on the game, introduced it into fashionable society. Hoyle was the father of scientific whist, and published his *Short Treatise* in 1742. Before his time the game was played nine points up; but he introduced the ten score, or long whist. It was in the early years of the 19th century that short whist, or the cutting down of the winning score from ten to five, came into vogue. The evolution of whist into a highly philosophical game took place in the decade following 1860, and was due to the labours of Henry Jones (‘Cavendish’), James Clay, M.P., and Dr. Pole. The first edition of *Cavendish on Whist* appeared in 1862, and two years later Clay produced his *Treatise on Short Whist*. American whist (known as straight whist) differs in one or two particulars from the English form. Rubbers are not played, honours are not reckoned, and the winning score consists of seven up in the clubs and tournaments, and, as a rule, five up in private circles. Duplicate whist, or the replaying of the same series of games with the cards of the respective sides exchanged, has obtained an immense popularity in America.

Whist is a game for four persons, two of whom are partners against the other two, each player sitting opposite to his partner. The partnership is determined by cutting from the pack, the two highest playing against the two lowest—ace counts lowest in cutting—and the person cutting lowest has the deal. The cards, after being shuffled by the dealer, are cut by the adversary on his right; the dealer then reunites the pack and deals it out, the last card being turned up to denote which suit is trumps. If a player can follow suit he must do so, otherwise he may trump (or ‘ruff’ as it is sometimes termed), or may throw away any card he pleases. The latter is called ‘discarding.’ To fail to follow suit when you

hold cards in it is known as ‘revoking,’ and for this irregularity the adversaries can deduct three tricks from the revoking side or add three points to their own trick score. The object of the game is for one side to score five points before the other side can do so. There are thirteen tricks to be made in each deal, and when two partners win more than six of these, every trick above six counts as an overtrick to the side making it, and the other side—except perhaps in honours—scores none. Five points constitute a game. There are four honours—viz. ace, king, queen, and jack of the trump suit. When two partners hold the four, individually or between them, they score four points. When they hold three honours, they score two points; and when the honours are divided equally between the two sides, they are not counted. Overtricks take precedence of honours in scoring. A side standing at four cannot score honours.

Whist is played in rubbers. A rubber consists of the best two out of three games. When a side wins two games in succession, the third game is not played. The stakes at English whist are fixed at so much per rubber point, which must not be confused with trick points. For winning the rubber two points are taken. For every game won when the adversaries have not scored at all a ‘treble,’ or three points, is taken; when the losers have scored less than three overtricks, a ‘double,’ or two points, is taken; and when the losers score three or four overtricks, the winners take a ‘single,’ or one point. When the losers of a rubber have won a game, the rubber points they have made on it are deducted from the gross rubber points of the other side.

You should always open the game by leading your longest and strongest suit, even if it be one of only four cards as against three in each of the remaining suits; for if the balance of your four-card suit be equally divided among the other players, and three rounds be played, your fourth card becomes the thirteenth and best, and when you lead it will either take the trick or force a trump. When you have five or six cards of a suit, your prospects of creating best cards are correspondingly greater; but you are not likely to make tricks with them unless all the adverse trumps have been previously drawn. A player with a preponderating run of trumps is able by playing them to draw the inferior or force the better ones, and still retain one or two to stop the run of an adversary’s plain suit, or to bring in his own

or that of his partner. You consequently endeavour to preserve a strong trump hand intact.

The first hand, as has been said, leads his longest and strongest suit. If he has the best cards, he continues playing them until he has reason to believe that the other side has no more of the suit and is likely to ruff it. When he opens from high honours in sequence, but not the best—such as king, queen, jack or queen, jack, ten—he plays the highest as information to his partner, and to force the better card or cards out of the way should they be with the adversaries; but with a single honour, or two honours not in sequence, or no honours at all, he leads his fourth best, except in the case of a suit headed by a king, jack, ten, when he leads the ten. Another exception is from ace and four or more small cards, when ace is led first, as holding it back involves the risk of getting it trumped on in a later round; or with ace only, you lead it off at once, as otherwise you may be compelled to cover your partner’s king should he play before you. When your partner opens a suit with the fourth best and subsequently drops a lower card, it is obvious that he originally held at least five of the suit. When third hand has to cover the trick, he does so with his best card, unless he has ace and queen, when he finesses the queen on the first round and plays the ace when he returns the suit; but except with ace and queen, he is seldom justified in finessing on a partner’s lead of a low card. From ace, king, or king, queen, lead the king. If it goes home, and your partner does not hold the ace, he knows you have it; but if he has it himself, or an adversary takes the king with it, he knows you have the queen.

With king, queen, jack, ten, however, you lead the ten; for if your partner has the ace, you want him to put it on and clear the suit for you. When you lead an honour other than the best and it takes the trick, you continue with your lowest of the suit. Second hand, as a rule, plays his lowest to the trick, unless a high card is led and he has two higher in sequence, when he covers with the lower of the two; or if he has ace, without other high cards, and an honour is led, he puts on the ace. By holding up his best cards he governs, to a certain extent, the strong leading hand. When fourth player takes the trick, he returns his own or his partner’s suit, or plays trumps if his partner has shown that he wants them. When a player does not cover the trick he plays

his lowest card. In leading a trick of a sequence play your highest; in covering a trick with a card of a sequence, your lowest, so that if you put the king on the jack, your partner knows for certain that you do not hold the queen. When holding six or more trumps, it is generally advisable to lead them, even if the rest of your cards are poor, for you clear the ground for any possibilities your partner may have in the plain suits. The method of signalling to your partner that you want trumps out is by playing to the current trick an unnecessarily high card, and to a later trick a lower one of the same suit—a trey followed by the deuce will serve the purpose. When the adversaries are cross-ruffing, lead trumps at once, even if you have only one, and lead trumps from similar weakness when you have a really fine all-round hand in the plain suits, but first show your best suit by playing a master card for one round. With weak trumps ruff a doubtful trick unhesitatingly, but with a strong trump hand give your partner the chance to win the trick. It is sometimes necessary to abstain from trumping even a certain trick, as when, for instance, you have the four best trumps and the whole command of a long suit. The fact that you want trumps out ought in such a case to be patent to your partner. Carefully note your partner's discard when he refuses to ruff. It comes from his weak suit. When he throws off a best card, it necessarily comes from his strong one.

In returning a partner's suit play back the winning card if you have it, otherwise lowest from three or more remaining, highest from two only, so that when you afterwards show a higher card than the one you returned, he knows you originally held at least four in suit. In opening a short weak suit lead your highest, as if it happens to be your partner's strong one it may help him. Let your first discard be from your weakest suit, unless trumps are declared against you, when you discard from your best protected suit and preserve the weak suits—which are doubtless the enemy's strong ones—to block his run in them. If you have the entire command of a suit, throw off the best card to show your partner that you have a sequence of the next best. Do not unguard an honour or bare an ace. Retain command of the adversaries' best suits by holding up master cards in them; but play off best cards in your partner's suits, and so vest the command with him.

Dummy Whist is the four-handed game played by three instead of four persons. One hand, which is called the dummy, lies exposed on the table, and throughout the rubber the person sitting opposite plays it in co-operation with his own hand. The laws are the same as those of whist, with the following exceptions:—(1.) Dummy deals at the commencement of every rubber. (2.) Dummy's hand is not liable for a revoke, and should one occur, and the trick be turned and quitted without protest, it stands good. (3.) Dummy being blind and deaf, its partner is not liable should he commit an irregularity from which he cannot derive advantage, such, for instance, as by exposing his cards, or by commenting on their character or on the state of the game.

Double Dummy is played by two persons, each having a dummy or exposed hand for his partner. The laws are the same as those of dummy whist, save that there is no misdeal, the deal being a disadvantage. See *The Principles and Practice of Whist*, by Lennard Leigh and Ernest Bergholt (1902); *Modern Scientific Whist* (ed. 1902), by C. P. D. Hamilton; *Laws and Principles of Whist* (1895), by 'Cavendish'; and *How to Play Whist* (1885), by Proctor.

Whistler, JAMES ABBOT M'NEILL (1834–1903), American impressionist painter, etcher, and lithographer; the magician of tone harmonies, who has done more to revolutionize taste in England than any other painter. Original, imaginative, his chief characteristic is supreme distinction—that is, he is a past master of the synthesis of pictorial art, that synthesis which is as much the conscious elimination of the superfluous as it is the happy aggregation of the essential; and his brush work is so masterly as to raise it in itself to the highest level of imagination in paint. Born at Lowell, Massachusetts, he entered the studio of Gleyre in Paris. His first painting, *The White Girl*, was exhibited at the famous Salon des Refusés. In 1859 he settled in Chelsea, and was the first to discover the artistic possibilities of that reach of the Thames. He exhibited frequently at Burlington House, until his magnificent *Portrait of my Mother* (Luxembourg at Paris) found one advocate only among the hanging committee of the year; it was, however, awarded the gold medal by the Salon of 1884, and bought by the French government. The equally fine *Portrait of Carlyle* is in Glasgow. Thereafter he exhibited regularly in the Grosvenor Gallery from 1877. In 1878

occurred the famous libel suit against Ruskin for criticising him in *Fors Clavigera*. Two series of *Notes, Harmonies, and Nocturnes*, signed with the mark of the butterfly, were hung in the Fine Art Society's Galleries in 1884 and 1886. Whistler found artistic life in Paris more sympathetic with and congenial to his ideals and temperament, and for many years he resided there and founded a school. In 1884 he was elected a member of the Society of British Artists, and president in 1886. He is author of *Ten o'Clock*, a lecture (1885), included in *The Gentle Art of Making Enemies* (1890); *The Butterfly and the Baronet*. The British Museum has a collection of his etchings. See 'Whistler,' in *Fifty Years of Art* (Art Journal publication, 1900); Whistler monograph, published by the Société de l'Art Indépendent, Paris; Way and Dennis's *The Art of J. M'Neill Whistler* (1904); Eddy's *Recollections and Impressions of Whistler* (1904); and Singer's *J. M'N. Whistler* (1905).

Whiston, WILLIAM (1667–1752), English divine and mathematician, was born at Norton, Leicestershire; received a fellowship at Clare College, Cambridge (1693). In 1696 he published a *New Theory of the Earth*. In 1701 he became deputy, and in 1703 successor, to Newton in the Lucasian professorship of mathematics at Cambridge; but an essay on the *Apostolical Constitutions*, and a denial of the doctrine of the Trinity as generally received, led to his removal from the professorship in 1710. In 1711 he published *Primitive Christianity Revived* (embodying the essay mentioned above). The remaining years of Whiston's life were spent in the promulgation of various theories, created or revived by him, and generally held to be erroneous, with regard to prophecy, the identity of the lost tribes, the healing of the sick, and other subjects. In 1730 he published a *Life of Samuel Clark*, and in 1736 a translation of *Josephus*. See *Memoirs* by himself (1749 and 1753).

Whitaker, JOSEPH (1820–95), English publisher, was born in London. In 1855 he commenced business on his own account as a theological bookseller, and became known as the publisher of the *Artist*, and later (1858) of the *Bookseller*, and afterwards as editor of the *Gentleman's Magazine*. The publication which has made his name a household word is *Whitaker's Almanac*, which was started in 1868. In 1874 he issued his *Reference Catalogue of Current Literature*, which is periodically reissued (new ed. 1906).

Whitbread, SAMUEL (1758-1815), English politician, born in London. In 1790 he entered Parliament as member for Bedford in the Whig interest. He became a partisan of Fox, vigorously identifying himself at the same time with every movement towards emancipation and reform. He took a leading part in the prosecution of Melville in 1805, and was chiefly instrumental in bringing about Chatham's resignation in 1810. He was throughout a strenuous advocate of peace; and from 1812

of the town being West Cliff. The mouth of the river is sheltered by two piers; West Pier, over 1,000 ft. long, affords a fine promenade. The church of St. Mary is an ancient structure, on a rocky platform, reached by steps; and near it are the ruins of Whitby abbey, originally founded in 658, destroyed by the Danes in the 9th century, and rebuilt soon after the conquest. In the old monastery died, in 680, the poet Caedmon, to whose memory a handsome Saxon cross was erected in the old church-

he urged the advantage of a compromise with the nonconformists. In 1683 he published a second part, urging dissenters to join the Church of England. Chief work—*A Paraphrase and Commentary on the New Testament* (1703; later ed. 1822). From Calvinism Whitby passed to Arminianism, and before his death held Unitarian views, as shown in his *Last Thoughts* (1727). See Sykes's *Account*, prefixed to *Last Thoughts*.

Whitchurch, mrkt. tn., Shropshire, England, 19 m. N. of Shrews-



A Picture by Whistler—Portrait of his Mother. In the Luxembourg.

till his death he constituted himself the champion of Caroline, Princess of Wales. He committed suicide while mentally deranged. See Hone's *Tributes of the Public Press to . . . Mr. Whitbread* (1815); also Le Marchant's *Life of Earl Spencer* (with biography of Whitbread, pp. 172-180).

Whitby, tn., N. Riding, Yorkshire, England, at mouth of Esk, 57 m. N.E. of York. It is a fashionable resort, the best part

yard in 1898. The characteristic industry of Whitby is the manufacture of jet ornaments. Pop. (1901) 11,748.

Whitby, DANIEL (1638-1726), English divine, controversialist, and commentator, born at Rushden in Northamptonshire; was appointed (1668) prebendary of Salisbury. His writings from 1664-89 were directed against Roman Catholicism; but in 1683 he published anonymously *The Protestant Reconciler*, in which

bury, with large cheese fairs. The church of St. Alkmund contains interesting monuments. Pop. (1901) 5,221.

White. (1.) River, Arkansas and Missouri, U.S.A., rises in the N.W. of the former state, crosses the boundary into southern Missouri, and then, turning S.E., flows through Arkansas to its junction with the Mississippi at the mouth of the Arkansas. It drains a large part of the Ozark plateau. Its length is about 800 m.,

and the area of its drainage basin 27,925 sq. m. It is navigable to Batesville, Arkansas. (2.) Group of mountains, New Hampshire, U.S.A. Under this name are commonly included most of the irregular groups of mountains scattered over the state; but the name is applied more particularly to the Presidential range in the S. part of Coos co., several summits of which exceed 5,000 ft., among them Mount Washington (6,293 ft.).

White, ANDREW DICKSON (1832), American statesman and author, born at Homer, New York; after being *attaché* at the United States legation at St. Petersburg, was appointed (1857-64) professor of history at Michigan University. He is, however, best known for his connection with Cornell University, of which he was president (1867-85). At the same time he was United States commissioner to Santo Domingo (1871), and minister at Berlin (1879-81); United States ambassador at St. Petersburg (1892-4); a member of the Venezuela Boundary Commission (1896-7); ambassador to Germany (1897-1902); and a member of the Hague Peace Conference (1899). His best-known book is *The Warfare of Science with Theology* (1876). See his *Autobiography* (1905).



Sir George Stuart White.
(Photo by Window & Grove.)

White, SIR GEORGE STUART (1835), British field-marshal, born in County Antrim, Ireland, and first saw service in the Indian mutiny (1857-8). He served throughout the Afghan campaign (1878-80), and won the Victoria Cross at Charasiab (Oct. 6, 1879)

and Kandahar (September 1880). In 1884-5 he was with the Nile expedition, and in 1886-9 he commanded the forces in Burma. In 1893 he succeeded Lord Roberts as commander-in-chief of the Indian army (1893-8). When the South African war broke out he was given the command of the Natal field force. He was shut up in Ladysmith on Nov. 2, 1899, and was not relieved until Feb. 28, 1900. Sir George White was promoted general and made G.C.M.G. (1900). He was appointed governor of Gibraltar (1900-4), and in 1905-6 sat on the War Stores Commission. Since 1905 he has been governor of the Royal Hospital, Chelsea.

White, GILBERT (1720-93), English naturalist, was born at Selborne. He became a fellow of Oriel College, Oxford, in 1752. After holding the living of Moreton Pinkney, he settled at Selborne (Hants) in 1751. Here he spent the remainder of his life, occupied in the observation of nature, the result being the *Natural History of Selborne*, projected in 1771 and finished in 1789, which is rather a collection of notes, anecdotes, and letters, than a systematized treatise on the subject. The best reprint is that edited by Thomas Bell (1877), occupier of White's house at Selborne. An edition by Dr. Bowdler Sharpe (1899) contains White's *Garden Calendar*, edited by Dean Hole. Appended to the *Natural History* is an account of the *Antiquities of Selborne*, in the preparation of which White received the assistance of Richard Chandler. See articles in *Notes and Queries* (1877-8); *Temple Bar* (April 1878); *Macmillan's Magazine* (July 1893); *Bibliography of Gilbert White*, by E. A. Martin (1897).

White, HENRY KIRKE (1785-1806), English poet, was born at Nottingham. In 1803 he published a volume of verse, *Clifton Grove . . . with other Poems* (1803), which attracted the notice of Southey. White died whilst at Cambridge. His mind was tinged with strong religious fervour. His *Remains* were edited by Southey (2 vols. 1807), with *Memoir*.

White, HUGH LAWSON (1773-1840), American jurist and statesman, born in Iredell co., North Carolina; became, successively, United States district attorney at Knoxville (1807) where he practised, judge of the supreme court (1801-7 and 1809-15), and state senator (1807 and 1817). He also acted as a commissioner to adjust the claims of Spain against the United States (1820), and was a senator (1825-35 and 1836-40). See *Memoir* by Nancy N. Scott (1856).

White, JOSEPH BLANCO (1775-1841), author, was born at Seville in Spain, of Irish descent. He was educated for the priesthood, but in 1810 finally left the Roman Catholic Church and came to England. Here he edited *El Español*, a Spanish periodical (1810-14), till he went to Oxford. In 1815 he accepted the tutorship of Lord Holland's son. His *Practical and Internal Evidence against Catholicism* (1825) won him a name as a defender of the church. In 1826 he returned to Oxford, where he became a friend of Newman, Pusey, and especially Whateley, with whom he lived at Dublin (1832-5) till, on becoming a Unitarian, he left Dublin to pass the rest of his days at Liverpool. Among his works are *Letters from Spain*, by Doblado (1822 and 1825); *Second Travels of an Irish Gentleman in Search of a Religion* (2 vols. 1833); *Observations on Heresy and Orthodoxy* (1835); *Autobiography*, edited by Thom (3 vols. 1845). He is best known as the author of a sonnet on *Night and Death* (1828).

White, MAUDE VALÉRIE (1856), French pianist, born at Dieppe; is also the composer and author of many popular songs, such as *Absent yet Present*, *O were my Love yon Lilac fair*, *The Sea hath its Pearls*, *To Blossoms*. She gained the Mendelssohn scholarship at the Royal Academy in 1879.

White, RICHARD GRANT (1821-85), American Shakespearean editor, born in New York; was from 1853 to the day of his death engaged in the study of Shakespeare and his period. From 1857 to 1865 his edition of Shakespeare was in process of publication; it is the best American edition of the great dramatist's works. During his later years (1858-78) he was employed in the United States Revenue Marine Bureau. The most notable of his other works are *Shakespeare's Scholar* (1854), *Memoirs of William Shakespeare* (1865), *Studies in Shakespeare* (1885), *Words and their Uses, Past and Present* (1870), *Every-day English* (1880), and *English Without and Within* (1881).

White, SIR WILLIAM ARTHUR (1824-91), British diplomatist, was born in Poland, and from 1864 to 1875 was consul at Danzig. He was then transferred to Servia as consul-general; in 1878 was appointed envoy-extraordinary to Roumania, and in 1885 at Constantinople. In 1886 he became ambassador-extraordinary at Constantinople.

White, SIR WILLIAM HENRY (1845), British naval architect, born at Devonport; obtained (1867) a first-class fellowship at

the Royal School of Naval Architecture; was professor of naval architecture at the Royal School and the Royal Naval College (1870-81), and director of the warship building department of Armstrong and Co. at Elswick, on the Tyne (1883-5), which position he resigned on his appointment as director of naval construction and assistant controller of the royal navy, a post which he occupied till 1902. He is the author of *A Manual of Naval Architecture* (5th ed. 1900), a standard work. He was knighted in 1895.

Whitebait, the young of the herring and the sprat. The whitebait fishery is especially carried on in the estuary of the Thames from February to August, and the product is esteemed a great delicacy in the London market. At one time it was believed that whitebait was a distinct species of the herring family, but it has been shown that it consists predominantly of young sprats in the early part of the season, the percentage of herring gradually increasing, until in June they are largely in excess, and afterwards decreasing, until in August the two fish are in approximately equal proportions. The fry of other species of the herring family also sometimes occur in whitebait. Whitebait are also taken in the estuary of the Forth and elsewhere. The fish are taken in stow nets or bag nets. In the early part of the 19th century the British cabinet ministers often used to go to Greenwich in the autumn and take together a 'whitebait dinner.'

White Beer, or **WEISS BIER**, a whitish, pale-coloured beer, possessing a tart or acid taste. It is a top-fermentation beverage, produced from a mixed grist of barley and wheat malts, or these with some sugars, and a water containing both gypsum and common salt. In certain places the worts are boiled, but generally they are unboiled; hence their turbidity. The quantities of hops vary from 2 to 2½ lbs. per quarter of malt used. The American white beers are much inferior to the European, the most noted of which are those of Berlin. Alcohol varies from 1.0 to 3.5 per cent. by weight.

Whiteboys. See **IRELAND—History**.

White Caps. See **VIGILANCE SOCIETIES**.

Whitechapel Murders. See **JACK THE RIPPER**.

White Colours. See **PIGMENTS**.

Whitefield, or **STAND**, residential dist., 5½ m. N.W. of Manchester, Lancashire, England. Pop. (1901) 6,588.

Whitefield, **GEORGE** (1714-70), one of the early leaders of Methodism, was born at Gloucester. At Oxford he came under the influence of the Wesleys, and formally joined the Methodists in 1735. After his ordination he preached with great success in several of the larger English towns and in London. In the year 1738 he sailed to join Wesley in carrying on a mission in Georgia, but returned to England in the same year, with a view to collecting funds for a projected orphanage in Georgia, the support and development of which became one of the great objects of his life. This tour was followed by six other visits to America, the last in 1769-70. Denied the use of their pulpits by the main body of the clergy, he held services in the open air, and often attracted audiences estimated at twenty thousand. Going to Scotland (1741), on the invitation of Ralph and Ebenezer Erskine, he travelled through the country preaching. A second tour in Scotland in 1742 resulted in a remarkable revival at Cambuslang, Lanarkshire. Early in 1741 a breach occurred between Wesley and Whitefield, the latter holding the Calvinistic doctrine of predestination, and Wesley the Arminian view. A personal reconciliation took place shortly afterwards, but the followers of Whitefield built for him the 'Tabernacle' in Moorfields, London. His *Works*, edited by John Gillies (6 vols. 1771-2), contain chiefly sermons. Whitefield owed his unexampled success as a preacher to his great dramatic talent, his eloquence, and his powerful and sympathetic voice. See *Life* by Tyerman (2 vols. 1876).

Whitefish, a name given (1) to the American species of the genus *Coregonus*, and (2) to the members of the genus *Leuciscus* (i.e. minnow, roach, and dace).

White Flag. The raising of a white flag in warfare is universally accepted as a token of surrender. Any officer or private in the British army displaying the white flag, or any other token of surrender to an enemy, is liable to be tried by general court-martial, and may be sentenced to death.

Whitehaven, munio. and parl. bor. and seapt., Cumberland, England, 7 m. S. of Workington. It has collieries and deposits of hæmatite iron ore. Pop. (1901) 19,324.

Whitehead, **CHARLES** (1804-62), English poet and novelist, was born in London, and in 1831 published *The Solitary*, a poem of real imaginative power. The humorous *Autobiography of Jack Ketch* (1834) led indirectly to

the production of the *Pickwick Papers* by Dickens. *Richard Savage*, a novel, and Whitehead's best work, appeared in 1842, with illustrations by Leech (new ed. 1896). A victim to intemperance, Whitehead went to Australia in 1837, and died in great want. *The Solitary*, and other Poems (1849) embodies Whitehead's collected poetical works. *Smiles and Tears* (collected stories) appeared in 1847, and a *Life of Sir Walter Raleigh* in 1854. See *Charles Whitehead*, by Mackenzie Bell (1884).

Whitehead, **SIR JAMES** (1834), English philanthropist, born at Appleby, Westmorland; was an alderman of the city of London (1882-96), sheriff (1884), lord mayor (1889), and member of Parliament for Leicester (1892-4). He mediated in and settled the great dock strike (1889), and is known as the founder of the penny-a-week collection for the metropolitan hospitals, and of the Rowland Hill Benevolent Fund in aid of post office servants.

Whitehead, **PAUL** (1710-74), English political satirist, was born in London; he was thrown into the Fleet for a debt for which he had offered security. In 1733 he published a poetical satire, *State Dunces*, and another, *Manners*, in 1739. He became a member of Sir Francis Dashwood's infamous brotherhood of Medmenham Abbey, and as such was attacked by Churchill in his satires. Other satires by Whitehead are the *Gymnasiad* (1744) and *Honour* (1747). His *Poems and Miscellaneous Compositions*, edited by Thomson, with *Life*, appeared in 1777.

Whitehead, **ROBERT** (1823-1905), English engineer and inventor, born at Bolton-le-Moors, Lancashire. At Milan he set up for himself, inventing and patenting machinery. He went to Trieste (1848), but settled later in Fiume. Here his first torpedo was invented (1866), and the invention was adopted for use in the Austrian navy (1868). The British Admiralty followed suit (1871), and the Whitehead torpedo has now been adopted in all navies. When first invented, the torpedo's range was 600 yds., at a speed of 8 knots; now it is effective at a maximum range of 4,000 yds., travelling at a rate of 36 knots. Firing apparatus, air pumps, and other accessories of the torpedo are also manufactured at Fiume, while a branch of the factory was established near Weymouth in 1890. See **TORPEDO**.

Whitehead, **WILLIAM** (1715-85), English poet, born at Cambridge; was made tutor of Clare College in 1742. He was (1754) travelling tutor to the son of the

Earl of Jersey, and in the Jersey family he found a permanent home. He was for some time reader of plays for Garrick, and wrote several dramas—*The Roman Father* (after Corneille), *Cleusa* (after Euripides), *The School for Lovers* (after Fontenelle). At the close of 1757 he succeeded Colley Cibber as poet-laureate. He was attacked by Churchill, and retorted in his *Charge to the Poets* (1762). He is not to be confused with Paul Whitehead, his contemporary. On the whole his verse was polished but spiritless. See *Life* by W. Mason, prefixed to *Whitehead's Poems* (3 vols. 1788).

White Horse, VALE OF THE. See BEKSHIRE.

Whiteing, RICHARD (1840), English author and journalist, born in London; became a pupil of Benjamin Wyon, royal seal engraver, and distinguished himself by a series of articles in *The Evening Star*, republished as *Mr. Sprouts: his Opinions*. He has served on the editorial staff of *The Morning Star*, *The Manchester Guardian*, *Globe*, and *Daily News*; also with the Press Association. He has written the novels—*The Democracy* (1876), *The Island* (1888), *No. 5 John Street* (1899), *The Life of Paris* (1900), *The Yellow Van* (1903), and *King in the New* (1906).

White Knights. See READING.

White Lady, in legend. The legendary White Lady of Scott's Monastery and of Scribe's *Dame Blanche* is derived from the Teutonic tradition, which speaks of a supernatural white woman attached to a royal or noble family. In France, whenever a king of the house of Bourbon was about to die, a tall woman, clad in white, was seen to walk along the galleries of the castle at midnight. The white woman appears also to peasants, to whom she gives some article which becomes transmuted into gold or silver. She has affinities with the Dame Berchta of Teutonic mythology. Like her, she is frequently described as engaged in spinning, or in beating flax. One tale speaks of three white ladies living in an enchanted castle, while no fewer than 'twelve white maidens' figure in another story. The white women of Dutch folklore are associated with caverns and hills.

White Lead is a basic carbonate of lead, $Pb(OH)_2PbCO_3$, much used as a pigment. The best quality is prepared by the Dutch process, in which sheets or grids of pure lead are placed in pots containing a little dilute acetic acid. A number of these pots are stacked in a heap, surrounded by horse manure (or, better, spent tan), and allowed

to stand for several months. As a result, lead acetate is formed, and then converted into the basic carbonate. This product is washed, ground, and dried, at a moderate temperature. The process may be expedited by treating the lead in chambers with the vapours of acetic acid, carbon dioxide, and water; but the product is inferior. The same defect is also inherent in even more rapid processes that have been introduced. White lead is a soft, heavy, earthy powder, of crystalline structure. It has much greater 'covering' power than any other white pigment, but is poisonous both in preparation and in use (its use is prohibited in France), and is blackened by hydrogen sulphide. It is largely substituted by other pigments, mainly on the ground of its cost. Of these, one of the best is the sublimed white lead obtained by oxidizing galena in a blast of air, and catching the fume in woollen bags. White lead itself is also frequently adulterated by the addition of barium sulphate or chalk.

White Leg, a painful disease associated with swelling of one or both legs. It occurs chiefly during the puerperium, but both sexes and all ages are liable to the affection, which not infrequently follows typhoid and other continued diseases. It is generally due to venous obstruction and thrombosis, but in many cases the lymphatic vessels share in the obstruction. A painless form is described, in which the lymphatics alone are said to be affected. Usually the affection begins with pain and tenderness in the groin. Swelling appears with or soon after the onset of the pain. Treatment should be both local and constitutional. Hot fomentations with poppy heads or laudanum should be frequently applied. Opium may also be given internally.

Whiteley's, a huge commercial establishment, founded by William Whiteley, a Yorkshireman, in Westbourne Grove, London.

Whitelocke, BULSTRODE (1605–75), commissioner of the great seal under the commonwealth, was born in London. He sat in the Long Parliament as member for Great Marlow, and in 1648 became one of the commissioners of the great seal, a post which he again held under Cromwell's son. In 1651 Cromwell sent him as ambassador to Sweden. At the restoration he was pardoned. His *Memorials* (1682, better edition 1732) constitute an account of the civil war and commonwealth. He also wrote *Journal of the Embassy to Sweden* (ed. H. Reeve, 1855). See *Memoirs* by R. H. Whitelocke (1860).

White Mountains. See WHITE.

White Pigments. See PIGMENTS.

White Sea, a large gulf of the Arctic Ocean, penetrating Archangel government, N. Russia. Its length from N.W. to S.E. is 300 m., and its area 36,500 sq. m. It is frozen from October to May. The fisheries are of considerable importance. Archangel is the chief port.

White Star Line, a line of steamships owned by the Oceanic Steam Navigation Company, which was formed in 1869 by Messrs. Ismay, Imrie, and Co., of Liverpool. The *Oceanic I.* sailed on her maiden voyage to New York in 1871, and was rapidly followed by larger vessels—the *Britannic*, in 1874, the first to exceed 5,000 tons (excepting the *Great Eastern*); the *Teutonic* and *Majestic*, designed as mercantile cruisers; and the *Oceanic* (1899). The last-named was the first vessel to exceed 15,000 tons and 700 ft. in length. In 1899 a Liverpool, South African, and Australian service was established. The company also maintains lines between Liverpool and Boston, Boston and Mediterranean ports, New York and Mediterranean ports, San Francisco, Yokohama, and Hong-kong, and also to New Zealand. In 1901 the *Celtic II.* (20,904 tons) was launched as the largest steamer ever built; but she has been surpassed by the *Cedric* (21,035 tons) and by the *Baltic* (23,876 tons), which first sailed in 1904, while the *Adriatic II.* (25,000 tons) is on the stocks (August 1906) at Belfast, and will take her place in the Liverpool and New York service early in 1907. The total fleet, mostly leviathans, numbers 30 vessels, of an aggregate tonnage of 372,584.

White Sulphur Springs, water-pl., Greenbrier co., W. Virginia, U.S.A., 82 m. E.S.E. of Charleston; has mineral springs.

White Swelling, a synonym for scrofulous disease of a joint.

Whitethroat, a name given to two members of the genus *Sylvia* (warbler). The common whitethroat (*S. cinerea*) is a frequent summer visitor throughout the British area, arriving about April. It is about five and a half inches long, and is grayish-brown above, with a white throat, the colour deepening to buff on the breast. The song is sweet, but the male has also a harsh alarm note. Though largely insectivorous, the whitethroat eats fruits and berries in their season. Its ally, the lesser whitethroat (*S. curruca*), may be distinguished by the conspicuous dark-brown ear-coverts. It is very fond of fruit. See WARBLERS.

White Vitriol is zincsulphate, $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$. See ZINC.

Whiteway, SIR WILLIAM VALLANCE (1828), colonial statesman, born in England. He was called to the Newfoundland bar in 1852, and in 1858 entered the legislature. After holding the office of speaker (1865-9) and that of solicitor-general (1873-8), he became premier and attorney-general (1878-85 and 1889-97).

Whitgift, JOHN (1530-1604), archbishop of Canterbury, was born at Great Grimsby, Lincolnshire. In 1555 he was elected a fellow of Peterhouse, Cambridge; Lady Margaret professor of divinity (1563); master of Trinity College (1567); bishop of Worces-

The cathedral is roofless, the chief feature being a beautiful round-headed archway. Pop. (1901) 1,183.



Whiting.

Whiting (*Gadus merlangus*) belongs to the same genus as the cod and the haddock, from which it may be distinguished by the absence of a barbel on the chin, the more slender form, and the presence of a dark spot at the root of the pectoral fin. It

Whiting. See CHALK.

Whitlow, or PARONYCHIA, is a term applied to various inflammatory conditions affecting the phalanges of the fingers, the thumbs, or more rarely of the toes, and generally leading to suppuration. As a rule whitlows result from the introduction of septic material through a minute wound, such as a prick or a scratch. The deeper forms are intensely painful, and if unrelieved the inflammation and swelling may extend up the limb, and result in general blood-poisoning and speedy death. Hot fomentations and soothing lotions, such as lead and opium, may be applied at first; but



A White Star Liner—S.S. 'Baltic,' 23,876 tons.

ter (1577); and archbishop of Canterbury (1583). Whitgift enjoyed the favour of Queen Elizabeth, who upheld him in the severity of his *Star Chamber Decree*, which limited the freedom of the individual and of the press in religious matters. A collection of his writings has been made for the Parker Society by J. Ayre (1851-3). See *Strype's Life and Acts of Whitgift* (1718).

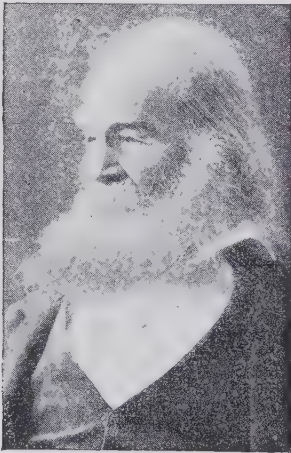
Whithorn (the *Leukopibia* of Ptolemy), parl. and royal bur., Wigtownshire, Scotland, 12 m. by rail s. of Wigtown, the reputed birthplace, and certainly the burial-place of St. Ringan or Ninian. Pilgrimages were made to his shrine (*Candida Casa*) from all parts of Scotland.

occasionally reaches a length of twenty-one inches. It is voracious and predaceous, living mostly on other fish. Females are twice more numerous than males. Spawning takes place principally in April and May, the female shedding about 300,000 eggs, which float in the water. The newly-hatched whiting is about one-seventh of an inch long; but growth is rapid, the average size in November being nearly five inches. The female spawns when two years old. Shoals of young whittings visit the bays and in-shore waters in summer. It is found all round the shores of the United Kingdom, and extends into the North Sea and Mediterranean.

should these fail to give speedy relief, early and free incision must be made, if possible, before suppuration occurs.

Whitman, WALT (1819-92), American poet, born at Long Island, New York. He never married; he never had any definite home. When we read his writings, it is as though we heard the echo of vast, complex, national life—too vast, too complex, to be reduced to the terms of any art, even that of the epic, but whose inchoate murmur or tumult at times becomes almost coherent, logical, and irrefutable in overwhelming largeness and intensity. When he was about sixteen he tramped the countryside 'teaching school.' In 1839-

40 he obtained, at Huntingdon, the editorship of the *Long Islander*, and in 1846 that of the *Brooklyn Eagle*; but after less than three years he set out upon a prolonged wayfaring through the central, southern, and western states. But some two years later we find him back in Boston, and once more (1851) editing a journal, the *Freeman*. Four years later he became known to the American public as Walt Whitman the poet ('the mad poet' was a not uncommon designation), for in 1855 he published *Leaves of Grass*, that perturbing and revolutionary collection of unrhymed and irregular verse. Upon this the 'general reader,' the leading critics, divines, and lecturers all combined in denouncing Walt Whitman as a revolutionary, as an abandoned



Walt Whitman.

voluptuary, as an unredeemed pagan, as a freethinker, as a literary charlatan, and so forth. He may be said to have conquered when, in 1860, he saw 'on the market' an enlarged and beautifully printed edition of his book, with the added section, now so well known and highly rated, *Calamus*. When in Brooklyn Whitman had combined editing and miscellaneous literary work with the trade of building and selling small houses. From December of 1862 till July 1865 he saw much of the sad and pitiable side of the civil war, and has left us a record in *Drum-Taps*. In the ensuing years he was a clerk in government offices in Washington, and in 1879 he visited Denver and the west. From 1873 till his death his home was at Camden, New Jersey, just across the Delaware from Philadelphia. Notwithstanding the interest of

Drum-Taps, *Democratic Vistas* (1871), and *Specimen Days* (1882), Walt Whitman is great by virtue of one book, or rather one life-work, *Leaves of Grass*. That he was a great artist in words is hardly to be maintained, but the problem is, Has he made a new art, and is he, within that art, a master? From the common standpoint, he may be set down as a magnificent freak, not for a moment to be compared with Americans such as Emerson, Thoreau, Hawthorne; but from the critics' he is immeasurably more American than any of these. He is indeed the only great American who has expressed the new creative energy and genius of his country in literature. In short, *Leaves of Grass*, is one of the great landmarks in modern intellectual life, in so far as it is the first milestone on the national road of the literature of America. A final and complete edition of his works, both prose and verse, appeared in 1889. See W. D. O'Connor's *The Good Grey Poet* (1866); monographs by Bucke (1885) and W. Clarke (1892); *Life* by H. B. Binns (1905); and *Days with Walt Whitman*, by E. Carpenter (1906).

Whitney, MOUNT, highest peak (14,898 ft.) in U.S.A. (excluding Alaska), in the Sierra Nevada, E. California, named after Professor J. D. Whitney.

Whitney, ELI (1765-1825), American inventor, born at Westborough, Massachusetts; devoted himself to teaching in Georgia, where he invented the first cotton gin for separating the seed from the cotton. For this the state of South Carolina voted him £10,000. He next (1798) turned to manufacturing firearms for the government, and was the inventor of other improvements on mechanical methods, from which he reaped a large fortune.

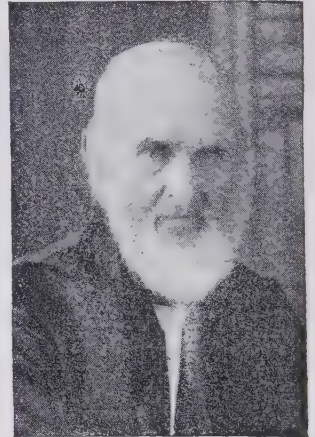
Whitney, JOSIAH DWIGHT (1819-96), American geologist, born at Northampton, Massachusetts, brother of the philologist. He was engaged in the geological survey successively of the regions of Lake Superior, Iowa, Upper Missouri, Wisconsin, and California. From 1835 he filled the geological chair in Harvard university. Among his more noted publications are the *Metallic Wealth of the United States* (1854), and the six volumes (1864-70) gathering up the fruits of his *Geological Survey of California*.

Whitney, WILLIAM DWIGHT (1827-94), American philologist, born at Northampton, Massachusetts. In the summer of 1849 he acted as assistant of the United States geological survey. He also took part (1873) in the geo-

graphical work of the Hayden expedition in Colorado. His special bent of study was, however, shown by his taking up Sanskrit. From 1854 professor of Sanskrit, and from 1869 also of comparative philology, at Yale, he prepared, in co-operation with Roth, an edition of the *Atharva Veda* (1856). He further organized, and for many years took charge of, the department of modern languages in Sheffield scientific school. His lectures on *Language* were published in 1867. President of the American Oriental Society (1884-90), he was the leading contributor to its *Journal*, as also to the *Transactions* of the Philological Association, which he helped to found in 1869. His *Sanskrit Grammar* (1879) at once took the first place. Another monumental work was *The Century Dictionary* (1888-91), of which he was editor-in-chief.

Whitstable, seapt. and bathing resort, Kent, England, on Whitstable Bay, 6 m. N.W. of Canterbury, is noted for its oyster fishery. Tankerton is a pleasant suburb. Pop. (1901) 7,086.

Whitsunday. See TERMS and PENTECOST.



John Greenleaf Whittier.

Whittier, JOHN GREENLEAF (1807-92), American poet, was born near Haverhill, Massachusetts. In 1829 he was editor of the *American Manufacturer*, and subsequently he edited several other papers. His sympathies were strongly against the slave trade, and his abolitionist poems won him the friendship of William Lloyd Garrison; indeed he has been called the poet laureate of abolition. Although somewhat lacking in fire and concentrated passion, his poems have the freshness of spring

flowers. Some of them indeed, as the *Slaver* of *Martinique*, are full of tragic pathos, but it is when he strikes a simple, spiritual note that he appeals most to the unspoilt heart—e.g. in *My Playmate*. But Whittier could raise a laugh and a tear together, as when he recites *Skipper Tresson's Ride*. His *Works* appeared in 7 vols. (1888). See *Life* by S. T. Pickard (1894).

Whittington, Dick (1358–1423), was the son of a Gloucestershire knight. In 1380 he was a substantial city mercer, and records exist of his having lent large sums of money to Richard II., Henry IV., and Henry V. He was lord mayor in 1397, and again in 1406. His benefactions aided St. Bartholomew's Hospital, Greyfriars library, and the Guildhall. He rebuilt Newgate, and founded a small hospital and college (suppressed in 1548) near his parish church of St. Michael de Paternoster. See *The Model Merchant of the Middle Ages*, by Samuel Lysons (1860); also the *Life*, by Besant and Rice (1894).

Whittlesey, or WHITTLESEA, mrkt. tn., Cambridgeshire, England, 6 m. E. by S. of Peterborough. St. Mary's church is partly Norman. Brick-making is important. Pop. (1901) 3,909.

Whitworth, tn., Lancashire, England, 3 m. N.W. of Rochdale; has cotton mills. Coal is mined and slate is quarried. Pop. (1901) 9,578.

Whitworth, Sir Joseph (1803–87), English engineer, was born at Stockport. Whilst working in London he made his first important discovery—a truly plane surface; and in 1833 he set up in business for himself as a tool-maker in Manchester. During the next twenty years he gradually developed his system of standard measures and gauges. After the Crimean war he began to make experiments with rifles, and later with cannon. The greatest of his discoveries in this connection was his method of obtaining sound castings from compressed steel. In 1868 he endowed thirty scholarships with the Science and Art Department for skill and knowledge of mechanics and cognate subjects. In 1869 he was created a baronet.

Whooper. See SWAN.

Whooping-cough. See HOOPING-COUGH.

Whortleberry, Bilberry, or Blueberry (Scottish BLA-BERRY), a common little British hill shrub, *Vaccinium myrtillus*, belonging to the order Vacciniaceae. It bears solitary, globose, reddish and green flowers, followed by dark-blue berries, which possess a pleasant and characteristic flavour. In America the

name huckleberry is given to this and kindred shrubs. See VACCINIUM.

Whydah, or WHIDAH, seapt. on Bight of Benin, Dahomey, W. Africa; was a former slave-trading centre. Pop. 20,000.

Whydah Birds. See WEAVER-BIRDS.

Wympy, Edward (1840), English mountaineer and explorer, was born in London. He ascended Mt. Pelvoux (1861), also the Pointe des Eerins, one of the highest peaks in the French Alps (1864); the Matterhorn (1865); visited Greenland (1867 and 1872), Ecuador and the Andes (1879–80), and Canada (1901). His best-known works are *Scrambles Among the Alps* (1871), *How to use the Aneroid Barometer* (1891), *Travels amongst the Great Andes of the Equator* (1892), *Chamonix and Mont Blanc* (new ed. 1901), *Zermatt and the Matterhorn* (new ed. 1901).

Whyte, Alexander (1837), Scottish preacher, born at Kirriemuir, Forfarshire; ordained to St. John's Free Church, Glasgow (1866); but his real usefulness began when, in 1870, he was called to be colleague and successor to Dr. Candlish at Free St. George's, Edinburgh. Three years later he was left sole pastor. Since then he has been one of the greatest spiritual forces in Scotland, with both voice and pen. His chief works are *Characteristics of William Law* (1893), *Jacob Behmen, an Appreciation* (1895), *Bunyan Characters* (1893–95), *Samuel Rutherford and some of his Correspondents* (1894), *Lancelot Andrewes and his Private Devotions* (1896), *Bible Characters* (1896–1900), *Santa Teresa* (1897), *Father John* (1898), *Sir Thomas Browne, an Appreciation* (1898), *Newman* (1901), *The Apostle Paul* (1903), and *Bishop Butler* (1903).

Whyte-Melville, George John (1821–78), Scottish novelist, born near St. Andrews; served in the army in 1839, and again in the Crimean war. His literary career began in 1850. His novels are full of freshness and charm, and deal chiefly with field sports and country pursuits. He was killed by a fall from his horse. Among his works are *Digby Grand* (1853), *General Bounce* (1855), *Kate Coventry* (1873), *Holmby House* (1860), *Market Harborough* (1861), and *Songs and Verses* (1869).

Wiborg. See VIBORG.

Wichita, city, Kansas, U.S.A., co. seat of Sedgwick co., 220 m. S.W. of Kansas City, on the Arkansas R.; with flour mills and meat-packing establishments. Pop. (1900) 24,671.

Wick, roy. and parl. bur. and co. tn. of Caithness, Scotland, on Wick Bay, opposite Pulteney-

town, 161 m. by rail N.N.E. of Inverness. It is a herring-fishing centre, and manufactures fish guano. Pop. (1901) 7,911.

Wickham, tn., suburb of Newcastle, N.S.W., Australia, about 1 m. from city, on Hunter R. It has engineering works, sawmills, and brewery. Pop. (1901) 7,752.

Wicklow. (1.) Maritime co., prov. Leinster, Ireland. In the centre, trending N. and S., are the Wicklow Mts. (Lugnaquilla, 3,039 ft.; Kippure, 2,473 ft.; Duff Hill, 2,369 ft.), intersected by picturesque gorges and valleys. The coast presents steep cliffs. Rivers are Slaney and Avoca, the last formed by the union of Avonmore and Avonbeg (the 'Meeting of the Waters,' immortalized by Moore). The Liffey rises in the north. In the Vartry valley are the reservoirs of the Dublin waterworks corporation. Amongst glens noted for their fine scenery are Glenmalur; Glendalough, with its beautiful lake; Vale of Avoca (also Ovoca), Devil's Glen, The Dargle, Powerscourt. The soil is fertile in the lower parts, but agriculture is limited. The county returns two members to Parliament. Area, 781 sq. m. Pop. (1901) 60,824. **(2.)** Market tn., Co. Wicklow, Ireland, 31 m. S.E. of Dublin. A new harbour has been constructed at a cost of £85,000. There are also large chemical works. Near the town is the 'Murrrough,' which has been acquired by government for a military station and artillery practice. Pop. (1901) 3,288.

Wickliffe. See WYCLIFFE.



Widgeon.

Widgeon, or WIGEON (*Mareca penelope*), a duck which breeds in Scotland, especially the north, while it winters in large numbers in parts of England. The male is finely pencilled with black above and white below, with a brown and buff head and dark gray quills. It has a whistling cry, whence the name of 'whew' or 'whence duck,' and feeds largely on the sea-grass *Zostera*. The flesh is esteemed as food. There are two other species of the same genus, both American.

Widin, or VIDIN, tn., Bulgaria, in extreme N.W. of country, on r. bk. of Danube; the seat of a metropolitan; has an ancient citadel (dismantled since 1878),

a school of viticulture, tobacco manufactories, breweries, and filigree works. Engagements were fought here between the Russians and Turks on Jan. 6 and April 19, 1854. Pop. 15,000.

Widnes, munic. bor., Lancashire, England, 13 m. S.E. of Liverpool; is a centre of alkali manufacture. Pop. (1901) 28,579.

Widow. See DISTRIBUTION, STATUTES OF; HUSBAND AND WIFE; and JUS RELICTÆ.

Widow-bird. See WEAVER-BIRDS.

Wieland, CHRISTOPH MARTIN (1733-1813), German writer, was born near Biberach in Württemberg. His early work is serious, somewhat dogmatic, and of little intrinsic value—*Der geprüfte Abraham* (1753), *Empfindungen eines Christen* (1755). About 1760 the influence of French and English philosophers, and the friendship of Count Stadion, an enthusiastic admirer of French literature, led to his preaching the same easy-going hedonism as his French models. The best known work of

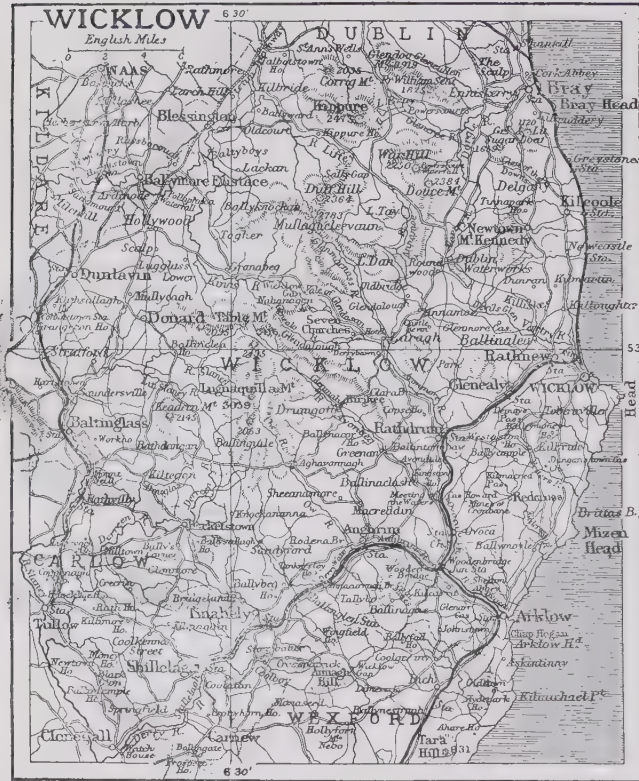
Wieland wrote some good short stories, especially *Geron der Adeltich* (1777); the admirable ironical tale *Die Abderiten* (1781); and his greatest work, the epic *Oberon* (1781), the main incidents of which are taken from the old French tale of Huon de Bordeaux. The elegance of style and the humour here displayed were entirely novel in German literature, and supplemented what Klopstock had done towards cultivating the language of poetry and vindicating the rights of imagination. Wieland translated twelve plays of Shakespeare (1762-6), and writings of Cicero and Horace; and showed consummate tact as editor (1773-89) of *Der Teutsche Merkur*, the literary organ of the Weimar poets. A complete edition of Wieland's works, in 53 vols., was published in 1818-28; another in 1900 (ed. Klee); his *Ausgewählte Briefe*, in 6 vols., in 1889. Selections from his works have been made by Proehle (6 vols. 1887), in Kürschner's *Deutsche National-Litteratur*, and by Muncker (6 vols. 1889). There are *Biographies* by Döring (1853) and Seuffert (1900).

Wieliczka, tn., Galicia, Austria, 9 m. by rail S.E. of Cracow; is noted for its rock-salt mines, containing subterranean town with chapels, etc. Serious damage was done by floods in 1868 and 1879. Pop. (1900) 6,293.

Wien, AUSTRIA. See VIENNA.

Wieniawski, HENRI (1835-80), Polish violinist and musical composer, born at Lublin; began to tour when eleven, and within a few years had an almost unrivalled reputation throughout Europe and America. He possessed extraordinary executive powers, was equally great as an exponent of classical and virtuosic music, and his compositions are very frequently performed in public. He was a professor at St. Petersburg Conservatory (1862-7) and at Brussels (1874-7). His brother Joseph (1837) early achieved distinction as a pianist and composer, and for some time held appointments in Moscow and Warsaw (1871-7), but subsequently returned to the concert platform.

Wier, JOHANN (1516-88), Dutch opponent of witchcraft, was born at Grave in N. Brabant. He began to practise medicine at Arnheim in 1545, and in 1557 became physician to the Duke of Juliers and Cleves. In 1563 he published *De Præstigiis Dæmonum et Incantationibus ac Veneficiis*. The work was placed in the Index. He also wrote *D: Lamis et Pseudomonarchia Dæmonum*, a satirical description of the underworld and its hierarchy. His *Opera Omnia* appeared in 1660. See Dr. J. Weyer [Wier], by Binz (1885).



Widsith, a poem of 143 lines in the *Exeter Book*. It has been analyzed into four parts—an introduction, a list of legendary kings, the Eormanric catalogue, and the Ealdhild lay, the last three being curiously interwoven with one another. The fact is, that the poem contains very early elements, among which imitative passages have been inserted. If we could believe Widsith's own statement, he lived about 400 A.D., for he was the contemporary of Eormanric and of Attila. The text is in Grein-Wülker's *Bibliothek der angelsächsischen Poesie* (1857-64).

this period is his novel *Agathon* (1766-7), which tells to some extent the story of Wieland's own development. Some short stories, charmingly told in graceful verse, were written about the same time. His appointment to a professorship at Erfurt in 1769 appears to have coincided with a change to a profound conception of the problems of life. His philosophical novel, *Der Goldene Spiegel* (1772), is a breviary for princes, and decided the Duchess Amalie of Saxe-Weimar to offer him the tutorship of her sons, Karl August and Constantine. At Weimar,

Wiertz, ANTOINE JOSEPH (1806-65), Belgian painter of historical subjects and portraits, born at Dinant. In 1832 he gained the grand prize at the Antwerp Academy, and settled (1836) at Liège, and in 1848 at Brussels, where out of state funds a studio, now known as the Musée Wiertz, was built for him. In the earlier period of his career he came under the influence of Michael Angelo, and later that of Rubens, and all his works strongly indicate a grotesque and fantastic imagination. Wiertz was also a writer on art, and he is known as the inventor of a new method of painting styled *peinture mate*. His writings appeared as *Œuvres Littéraires* (1869). See *Lives* by Labarre (1866) and Claessens (1883).

Wiesbaden (Lat. *Mattiacum*), wat.-pl., prov. Hesse-Nassau, Prussia, on s. slopes of Mt. Taunus, 6 m. N.W. of Mainz; has thirty hot springs. The gaming tables were abolished in 1872. Pop. (1900) 86,111.

Wiesen, Swiss health resort, canton Grisons, in the Davos valley, 12 m. s.w. of Davos, at an altitude of 4,771 ft.

Wife. See HUSBAND AND WIFE, AND MARRIAGE.

Wiffen, BENJAMIN BURRON (1794-1867), English ecclesiastical biographer, was born in Bedfordshire, and was an ironmonger till 1838. He then devoted himself to literary pursuits. In 1839 he became interested in all things Spanish—in particular in the Spanish reformers. He promoted the publication of their works, translated some of them into English, and published biographies of the more notable of them. See Pattison's *The Brothers Wiffen* (1880).

Wiffen, JEREMIAH HOLMES (1792-1836), English translator of Tasso, was born in Bedfordshire, and became a schoolmaster in 1811; and during the next ten years published various volumes of verse. In 1821 he became librarian at Woburn Abbey, for the Duke of Bedford, and began the publication of his translation of Tasso, which was not finally completed till 1824. He published, in 1833, *Historical Memoirs of the House of Russell*. See Pattison's *The Brothers Wiffen* (1880).

Wig (contraction of 'periwig,' 'peruque'), an artificial head-dress of hair, used in case of baldness on the stage, by judges and barristers, and formerly, for fashion, by all classes. Found on Egyptian mummies, known to the Eastern nations, and to the Greeks and Romans, it was worn by Hannibal as a disguise (Livy), by the emperors Otho, Domitian, Caracalla, to cover their baldness. But the Roman wig was a kind

of skull-cap fringed with hair. More artistic, no doubt, were the blond wigs for ladies, alluded to by Ovid and Martial. The early church writers (e.g. Tertullian) denounced wigs as 'of the devil,' but finally adopted them as professional attire in the 17th century. In England Bishop Blomfield was the first to wear his

xv. reduced its dimensions, and Benjamin Franklin stood wigless before Louis xvi. The revolution abolished wigs, but the patriots introduced the 'Brutus' type. (See Thiers's *Histoire des Peruquiers* (1690), and *L'Encyclopédie Perruquière*, 1757.) 'Great Eliza' had many wigs, and Mary of Scotland died in an auburn head-dress.



Ancient and Modern Patterns of Wigs.

own hair, and Archbishop Sumner wore a wig (1858) at the marriage of the princess royal. Wig-wearing was rendered fashionable in France by Louis XIII., though in the 14th century false tresses (*coifs à templettes*) had been worn by ladies. Louis XIV. (1673) raised the wig to its highest degree of size and fashion. Louis

On the stage blond wigs were worn by heroes, black by villains (Lloyd in *The Actor*, 1762). Queen Anne's reign saw the apotheosis of the English wig, and produced the Ramillies variety. Hogarth has illustrated *The Five Orders of Periwigs* (episcopal, aldermanic, legal, 'queerinthian'—for noblemen—and composite).

Wigan, munic., parl., and co. bor., Lancashire, England, 19 m. N.W. of Manchester. The church of All Saints contains monuments of the Earls of Crawford. There are handsome municipal and other public buildings; cotton factories, oil works, foundries, and railway-wagon works, and trade in coal, from collieries in the district. Pop. (1901) munic. bor. 82,428.

Wigeon. See WIDGEON.

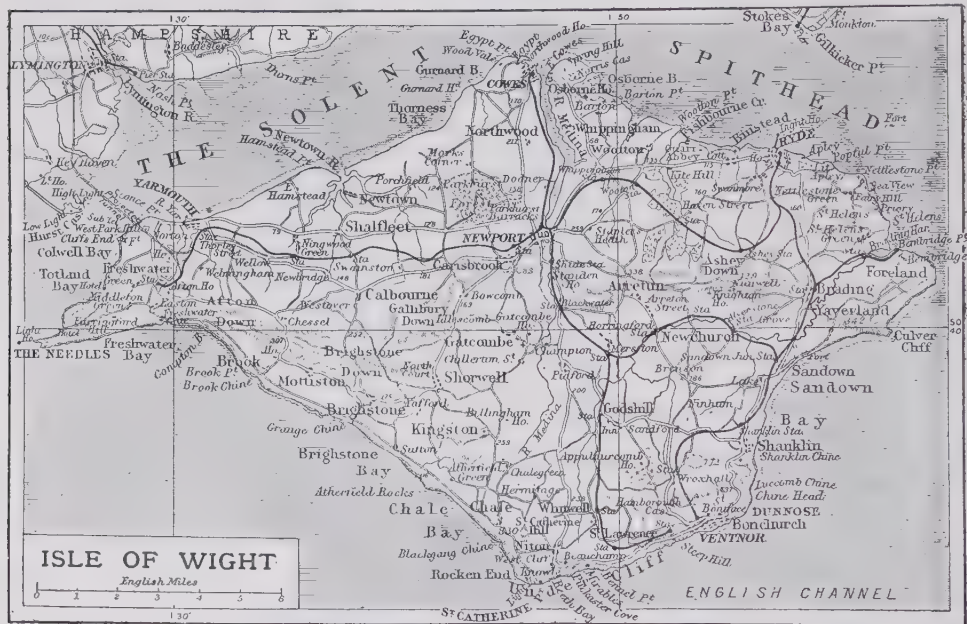
Wiggin, KATE DOUGLAS, afterwards RIGGS (1857), American authoress, born in Philadelphia; organized the first free kindergarten schools for poor children on the Pacific coast. Among her numerous publications are *The Birds' Christmas*

Spithead, and bounded on s. by the English Channel. Shape, an irregular diamond, 23 m. E. and W., 13 m. N. and S. The coasts are sloping on N., more uniform on S., and bordered by cliffs, intersected by picturesque 'chines' excavated by small streams, and generally covered with verdure. The Undercliff (10 m.) is a beautiful stretch of coast. Off the W. extremity are the Needles, isolated jagged rocks, with lighthouse. The island is very hilly. Highest summit, St. Boniface Down (about 787 ft.), near Ventnor. Cowes and Ryde, in the N., are yachting centres; Newport (the capital), Ventnor on the Undercliff (specially recommended in

racks and a convict prison. The island, named by the Romans Vectis, was held by them for over four hundred years. In the 6th century it was taken by the Saxons. Since the time of Edward I. it has been under wardens appointed by the crown, the present governor being H.R.H. Princess Henry of Battenberg. Area, 147 sq. m. Pop. (1901) 82,418.

Wigton, mrkt. tn., Cumberland, England, 11 m. S.W. of Carlisle; has tanning, jam, and other industries. Pop. (1901) 3,691.

Wigtown, (1.) County in extreme S.W. of Scotland, the W. div. of ancient Galloway. Two arms of the Irish Sea—Luce Bay and Wigtown Bay—enter on the S., and Loch Ryan, an arm of the



Carol (1888); *The Story of Patsy* (1889); *A Cathedral Courtship* (1893); *The Village Watch Tower* (1895); *Marm Lisa* (1896); *Penelope's Progress* (1898); *Penelope's Experiences in Ireland* (1901); *Penelope's Experiences in Scotland* (5th ed. 1899); *Penelope's English Experiences* (1900); *The Diary of a Goose Girl* (1902); *Half-a-dozen Housekeepers* (new ed. 1904); *Rebecca of Sunnybrook Farm* (1904); *Rose o' the River* (1905); and *Kindergarten Principles and Practice* (1896), and other works in collaboration with Nora Smith.

Wight, THE ISLE OF, isl., Hants, England, separated from the mainland by the Solent and

pulmonary affections), Shanklin, Bonchurch, Freshwater, Yarmouth, and other places, are favourite resorts. Among points of interest may be noted Carisbrooke Castle, near Newport; Osborne House, near Cowes, a favourite residence of the late Queen Victoria, presented to the nation by King Edward VII., and now a convalescent home for officers of both the services; the Royal Naval College (opened 1903); Farringford House, near Freshwater Bay, a residence of the late Lord Tennyson; the ancient barrows of Freshwater Downs, and the coloured cliffs of Alum Bay, north of the Needles. At Parkhurst are military bar-

Firth of Clyde, enters on the N.W. The coast in general is bold and rocky; the interior consists of moorland and rolling hill. Streams and lochs are numerous but small. The county is generally divided into three parts—(1) the Rhinns of Galloway, the peninsular part; (2) the Machers, the triangular portion between Luce Bay and Wigtown Bay; and (3) the moors to the N. Some 49 per cent. of the area is under cultivation, the chief crop being oats, but the chief industries are cattle-raising and dairy-farming, and creameries are becoming numerous. Pop. (1901) 32,685. (2.) Town, roy. and munic. bur. and seapt., Wigtownshire, Scotland,

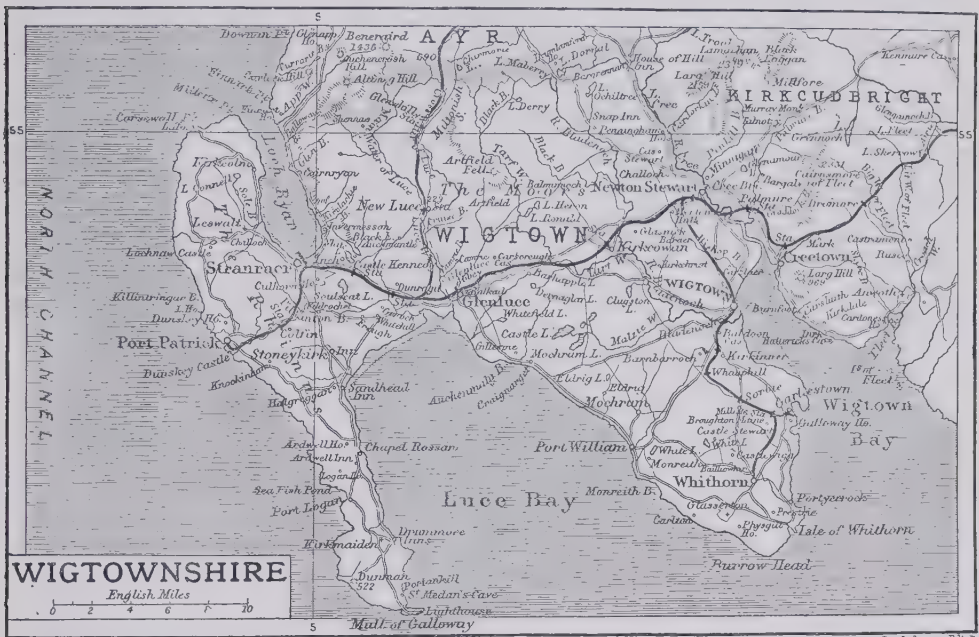
on a hill overlooking the w. shore of Wigtown Bay, 129 m. by road s.s.w. of Edinburgh; has a monument on Windy Hill to the Wigtown martyrs, Margaret Wilson and Margaret MacLachlan, who on May 11, 1685, for refusing the Abjuration Oath, were tied to stakes in the Water of Bladnoch, and were drowned by the incoming tide. Pop. (1901) 1,386.

Wigwam, the name given to the hut or dwelling-place of the Indians of N. America. It is of a conical shape, and is built of some light material, such as the bark of trees. Sometimes the skins of animals stretched across poles constitute a wigwam.

horse. In the House of Lords he was the spokesman of the Church, and it was owing to his efforts that authority was restored to the convocations. Although at one time popularly suspected of a leaning to Roman Catholicism, he was in reality strongly opposed to any attempt to Romanize the Church of England. A similar misunderstanding existed over his attitude towards Hampden, whose appointment to the see of Hereford Wilberforce at first opposed and afterwards favoured. His chief works were *Letters and Journals of Henry Martyn* (1837); *Eucharista*, Agathos (1839); *History of the Protestant Episcopal Church*

tions condemning the slave trade were on three occasions (in 1789, 1791, and 1804) passed by the House of Commons, but it was not until 1807, after the death of Pitt, that the Bill of Abolition became law. Wilberforce's energies were then transferred to the cause of emancipation. He retired from Parliament in 1825. He wrote a book on *Practical View of Christianity* (1797). See *Memoirs of W. Wilberforce*, by his sons (1838), in 5 vols., and a condensed ed. (1868) in 1 vol. Also *Correspondence*, by his sons (1840).

Wild, JONATHAN (c. 1682-1725), receiver of stolen goods and informer, born at Wolverhampton;



Wijk-aan-Zee ('on Sea'), seaside resort, Netherlands, prov. N. Holland, on North Sea, 10 m. n.w. of Haarlem. Pop. (1900) 2,227.

Wi-ju, tn., Korea, on s. bank and near mouth of Yalu R.; chief commercial port with China. Pop. 20,000.

Wilberforce, SAMUEL (1805-73), English prelate, son of William Wilberforce, was born at Clapham, London. He was rector of Brighthelm, Isle of Wight (1830-40), and of Alverstoke (1840-5), being also during this period successively archdeacon of Surrey, canon of Winchester, and dean of Westminster. In 1845 he became bishop of Oxford, and in 1869 bishop of Winchester. He was killed by a fall from his

in America and Rocky Island (1840); *Heroes of Hebrew History* (1870). See *Life of S. Wilberforce*, by his son and Ashwell (1879-82); *Bishop Wilberforce*, by Daniell (1891); and *Life*, by R. C. Wilberforce (1905).

Wilberforce, WILLIAM (1759-1833), English philanthropist, was born at Hull. He entered Parliament as member for Hull when only twenty-one, supporting Pitt, of whom he became a fast personal friend. In 1787 Wilberforce became parliamentary leader of a committee of philanthropists pledged to the cause of abolition, and from this time he exerted all his powers in its support. Owing to his efforts, aided by the influence of Pitt, resolu-

became the head of an elaborate organization of thieves in London. His career was, however, checked by imprisonment, on the ground of causing a riot, and terminated by hanging at Tyburn. See Jackson's *Newgate Calendar*; also *History of the Life of Jonathan Wild*, by H. D. (1840); and Fielding's satirical *History of the Life of the late Mr. Jonathan Wild the Great* (1743).

Wildbad, wat.-pl., in the Black Forest, Württemberg, Germany, 20 m. s.s.e. of Karlsruhe; has hot springs and baths. Pop. (1900) 3,532.

Wild Birds Protection Acts, 1880, 1881, 1894. Any person killing, taking, or attempting to kill or take, or exposing for sale,

between the 1st of March and the 1st of August, any of 86 different kinds of birds is liable to a fine of £1, and in the case of any other wild bird (except when the person killing or taking is the occupier of the land or some one authorized by him) to a reprimand on the first offence and a fine of 5s. per bird for a subsequent offence. The acts do not apply to the island of St. Kilda. By the Act of 1894 the secretary of state, on the application of the county council, may forbid the taking of wild birds' eggs at any season or in any district.

Wild Boar. See BOAR.

Wilde, JANE FRANCISCA, LADY (1826-96), Irish authoress, was born at Wexford, and became early imbued with Nationalist ideas, and contributed largely to the columns of the *Nation*, under the pseudonym of 'Speranza.' An article of hers in the last issue (1848), entitled '*Jacta alea est*,' was the principal charge against Charles Gavan Duffy when tried for treason. She published *Poems by Speranza* (1871); *Ancient Legends, etc., of Ireland* (1887); *Ancient Cures, Charms, and Usages of Ireland* (1890); *Notes on Men, Women, and Books* (1891); *Social Studies* (1893).

Wilde, OSCAR O'FLAHERTIE WILLS (1856-1900), Irish author and dramatist, born at Dublin, second son of Lady Wilde. In 1878 he won the Newdigate prize at Oxford with the poem *Ravenara*. But staid Oxford was scandalized by the prodigal way in which Wilde lived, the luxury of his *ménage*, his intellectual affectations and æsthetic pose, and by the audacity of his opinions as to the conduct of 'emancipated' life, and as to the methods and aims and end of art—literary, manual, and musical. He aspired to be the chief hierophant of the great movement captained by Ruskin, by Rossetti, by William Morris, by Edward Burne-Jones, and others—to demonstrate in life the theoretical ideals of beauty so searchingly considered and beautifully set forth by Walter Pater. It has been said that he owed much to his extreme Celtic temperament, and certainly in wit and poignant oral fencing no dramatist since another and greater Irishman, Sheridan, can be compared with him. But the same extreme Celtic temperament may as logically be held to account for the lack of poise, of balance, of judgment; for the exaggerated running of complex, but in the main lofty and noble, ideas, through indifferent means to an ignoble end, revealed in his doctrine of 'art for art's sake'—a doctrine, in his case, which simply meant the cult of pleasurable

sensation. In 1882 he went to America, and gave no fewer than two hundred addresses on æsthetic philosophy; and, while in the United States, produced a drama called *Vera*. By 1890 he had achieved a high reputation as author and dramatist, besides maintaining his position as 'the Beau Brummel of society and the arts.' *The Happy Prince and Other Tales* (1888) was followed by *Lord Arthur Savile's Crime and Other Stories*, and his chief prose work, *The Picture of Dorian Gray*, and a brilliant and suggestive volume of essays, *Intentions* (1891); in this last year also was produced in New York his play *The Duchess of Padua*. In 1892 his first dramatic success was won by *Lady Windermere's Fan* (published in 1894), followed by *A Woman of No Importance* in 1893, *The Ideal Husband* (produced in 1895), and *The Importance of being Earnest* (produced 1895, but not published till 1899). His play *Salomé* (1893), written in French, was refused by the licenser of plays on account of its Biblical subject, but was produced in Paris (1894) by Sarah Bernhardt. His other books are the *Ballad of Reading Gaol* (1898) and *De Profundis* (1905). In March 1895 Wilde instituted an action against the Marquis of Queensberry, with the result that the evidence against Oscar Wilde himself of indulging in immoral practices was so overwhelming that his arrest and trial became inevitable. After trial he was sentenced to two years' imprisonment with hard labour. It was during this period that *Reading Gaol* and *De Profundis* were written. See *Life*, by R. H. Sherard (1902).

Wildebeest. See GNU.

Wildenbruch, ERNST VON (1847), German novelist, poet, and dramatist, born at Beirut in Syria. After going through the wars of 1866 and 1870-1 he entered the state service, and was appointed a judge at Frankfurt and at Berlin, and in 1877 entered the Foreign Office. Wildenbruch has won the greatest fame by his dramas, such as *Harold*, *Die Karolinger*, *Der Mennonit*, *Die Quitzows*, *Generalfeldoberst*, *Heinrich und Heinrichs Geschlecht*, *Die Tochter des Erasmus*, *König Laurin*. He has also won recognition as a novelist with *Der Meister von Tanagra* and *Novellen*, and as a poet with *Vionville*, *Sedan*, and *Lieder und Balladen*.

Wilderness, desolate and swampy district in N.E. Virginia, U.S.A., 2 m. S. of the Rapidan R.; was on May 5 and 6, 1864, the scene of an indecisive battle between the Federals under Grant and the Confederates under Lee.

Wild Fowl, a term applied generally to wild birds shot for sport, especially to ducks, geese, and other water-fowl, and to shore game-birds. From its vagueness the term is falling into disuse. See *Wild Fowl*, in *Fur, Feather, and Fin Series* (1905); also DECOY, DUCK SHOOTING, CLOSE TIME, and WILD BIRDS PROTECTION ACTS.

Wild Hunt, a phantom chase of German legendary lore. The common predominating idea is that of the appearance of a pack of hounds and mounted men careering in full cry across the midnight sky, to the accompaniment of a peculiar rushing sound. The presence of the Wild Huntsman, with his train of followers, bodes evil to the spectator, and dire calamity is certain to fall upon any one who may have the temerity to address him. In England the same idea of a ghostly aerial hunt finds expression in the legendary tales associated with Gabriel's Hounds, the Wisht Hounds, and so forth.

Wilfrid, St. (634-709), bishop of York, was born in Northumbria, and brought up in the monastery at Lindisfarne. He became (658) leader of the pro-Roman party, and won over the king of Northumbria to their side. He was chosen bishop of York, but suffered shipwreck on his way to Rome, and preached to the heathen Frisians. See *Life in Raine's Memorials of the Church of York* (1879).

Wilhelm, KAISER. See WILLIAM II. (of Germany).

Wilhelmina (1880), queen of Holland, or, as her full name runs, Wilhelmina Helena Pauline Maria, born at the Hague, her father being William III., and her mother Emma, a princess of Waldeck-Pyrmont. Wilhelmina succeeded to the throne in November 1890, being placed under the care of her mother as queen-regent. On attaining her eighteenth year she assumed the reins of power. In February 1901 she married Henry Duke of Mecklenburg-Schwerin, who took the title of Prince Consort.

Wilhelmshaven, sea-bathing resort and naval station of Germany, on the W. side of Jahde Bay, 41 m. N.W. of Bremen; was inaugurated by King William in 1869. Besides the old and new harbours, there are an equipment dock, a shipbuilding basin with three dry docks, a torpedo harbour, foundries, boiler works, etc. The employes live mostly at Bant, to the W. Pop. (1900) 22,682.

Wilhelmshöhe. See KASSEL.
Wilken, GEORGE ALEXANDER (1847-91), Dutch ethnographer, born in Java; served in the Dutch Indian Civil Service. In 1885 he was appointed, at Leyden in Hol-

land, professor of the geography and ethnography of the Indian Archipelago, on which he afterwards wrote a number of learned treatises.

Wilkes, CHARLES (1798-1877), American naval officer, born in New York. In a United States expedition (1838-42) he discovered the Antarctic continent, and published a *Narrative* (5 vols. 1845). In November 1861 he captured J. M. Mason and J. Slidell, Confederate commissioners, from the British steam-packet *Trent*, and afterwards commanded a squadron in the W. Indies, and was made a rear-admiral (1866). (See also *TRENT AFFAIR*.) He also wrote *Western America* (1849), and *Theory of the Winds* (1856).

Wilkes, JOHN (1727-97), English politician, was born in London. He entered Parliament in 1757 as member for Aylesbury and as a supporter of Pitt; but disagreeing with the foreign policy of the government, he attacked it by speech and pamphlet. In June 1762 he founded the *North Briton*, a paper which existed for the sole purpose of satirizing the government (Lord Bute) and the court, and which, owing to an article on the king's speech in No. 45, was suppressed as a seditious libel. Wilkes himself was arrested, and although discharged by the judges on the ground of privilege, as a member of Parliament, was in the autumn of the same year (1763) expelled from the House of Commons, and outlawed, not only for reprinting No. 45, but for printing (though privately) an 'impious libel' entitled an *Essay on Woman*. He lived in Paris and Italy until 1768, when he returned to London in defiance of his outlawry, and was at once elected M.P. for Middlesex. He was again expelled from the Commons, and imprisoned for two years; but being, in 1774, re-elected, he continued to represent Middlesex until his retirement in 1790. Wilkes, on his release from prison in 1770, championed the city in its contests with Parliament and court. He was elected lord mayor, and upheld the power of the law during the Gordon riots.

Wilkes was celebrated for his ugliness and his wit. He was at once a man of fashion, a lover of letters, a keen politician, and one of the most vigorous personalities of his age. He wrote several numbers of the *Monitor* (between Nos. 340 and 380), and the first forty-six numbers of the *North Briton*. Collections of his *Letters* were published in 1804 and 1805, and of his *Speeches* in 1777 and 1786. See *Life* by Fitzgerald (1888).

Wilkesbarre, city, Pennsylvania, U.S.A., co., seat of Luzerne co., in the anthracite coal region, 100 m. N.N.W. of Philadelphia. Its principal manufactures are silk and cotton goods. Pop. (1900) 51,721.

Wilkie, SIR DAVID (1785-1841), Scottish painter and etcher, the foremost of British historical genre painters, called the Scottish Teniers, was the son of a

for Scotland in 1823; painter in ordinary to George IV. in 1830; and knighted in 1836. During the latter part of his career he painted many portraits, among others of *Sir Walter Scott* and *Family* at Abbotsford (1817); also the portrait group *Queen Victoria's First Council*. In 1840 he went to Constantinople, the Holy Land, and Egypt; and dying on the homeward journey, he was



Wilhelmina, Queen of Holland.

minister of Cults, Fifeshire. He entered the Royal Academy Schools at Edinburgh when fourteen. *Pitlessie Fair*, the first of a series of pictures depicting national and parochial life, was painted in 1804, and was followed by his *Village Politicians*, *The Blind Fiddler*, *Rent Day*, *The Chelsea Pensioners*, and others. He was elected A.R.A. in 1809, and R.A. in 1811; limner

buried at sea off Gibraltar. The national collections of London and Edinburgh, the municipal galleries of Glasgow and Liverpool, are rich in Wilkie's pictures. See *Lives* by A. Cunningham (1843), Lord R. Gower (1902), and Bayne (1903).

Wilkins, JOHN (1614-72), bishop of Chester, born in Northamptonshire. He became successively vicar of Fawsley (1637),



A Picture by Sir David Wilkie, R.A.—'The Blind Fiddler.' In the National Gallery, London.

chaplain to the Count Palatine, warden of Wadham College, Oxford (1648), and master (1659) of Trinity College, Cambridge. His interest in philosophy and science drew around him a distinguished circle of men, the nucleus of the Royal Society. Although at first parliamentary in his tendencies, Wilkins swore allegiance to Charles II., and became (1668) bishop of Chester. He is the author of *Discovery of a New World* (1638); *Discourse concerning a New Planet* (1640); *Mercury, or the Secret and Swift Messenger* (1641); *Mathematical Magic* (1648); and *Essay towards a . . . Philosophical Language* (1668).

Wilkins, MARY ELEANOR, afterwards FREEMAN (1832), American authoress, born at Randolph, Massachusetts; has written a number of popular novels, including *A Humble Romance* (1887), *Jane Field* (1892), *The Jamesons* (1894), *Pembroke* (1894), *Madelon* (1896), *Silence* (1898), *The Love of Parson Lord* (1900), *The Heart's Highway* (1900), *The Portion of Labour* (1901), and *The Wind in the Rose Bush* (1903).

Wilkins, PETER. See PALTOCK, ROBERT.

Wilkinsburg, bor., Allegheny co., Pennsylvania, U.S.A., 5 m. E. of Pittsburgh. Pop. (1900) 11,886.

Wilkinson, HENRY SPENSER (1853), English war correspondent and journalist, born in Manchester; became a barrister (1880), and served on the staff of the *Manchester Guardian* (1882-92). His works include *Citizen Soldiers* (1884), *Essays on the War Game* (1887), *Exercises in Strategy* (1887), *The Brain of an Army* (1890; new ed. 1895), *The Great Alternative* (1894), *The Command of the Sea* (1894), *The Brain of the Navy* (1895), *The Nation's Awakening* (1896), *British Policy in South Africa* (1899), and *War and Policy* (1900); and edited *Twelve Soldiers* (1899).

Wilkinson, JAMES (1757-1825), American general, born near Benedict, Maryland, and served under Arnold in the Northern army. He was secretary of war, and general-in-chief of the forces in Louisiana. Twice tried for dereliction of duty, he was in both cases honourably acquitted. He died in Mexico, where he wrote *Memoirs of My Own Time* (1816).

Wilkinson, JAMES JOHN GARTH (1812-99), English Swedenborgian, was born in London, where he set up practice as a homœopathic doctor. He was a mystic by temperament, and the influence of Blake's *Poems* is apparent in a volume of verses, *Improvisations from the Spirit* (1857). From 1839 he devoted his literary efforts to the translation and explanation of Swedenborg's writings, and won the friendship of Emerson, Car-

lyle, and others. He was a strong anti-vaccinationist and anti-vivisectionist.

Wilkinson, SIR JOHN GARDNER (1797-1875), English explorer and Egyptologist, born in Westmorland; spent twelve years (1821-33) in Upper Egypt and Nubia, in travelling and making discoveries of buried tombs. On his return to England he was elected F.R.S., and knighted (1839). He made four subsequent journeys to Egypt in 1841, 1843, 1848, 1855; and in 1844 he travelled also through Montenegro and Bosnia. His principal works are *Materia Hieroglyphica* (1828), *The Topography of Thebes* (1830), *Manners and Customs of the Ancient Egyptians* (1837-41; new ed. 1879), *Modern Egypt and Thebes* (1844), *Architecture of Ancient Egypt* (1850), and *Egypt in the Times of the Pharaohs* (1857).

Will. All persons except lunatics and infants may now make a will, which must be in writing and signed by the testator, or by some other person in his presence and by his direction, at the foot thereof, in the presence of two or more witnesses, who must subscribe their names. If one of the attesting witnesses is a legatee, or the wife or husband of a legatee, the will is good, but the legacy is void. Any alteration in a will must be attested as if it was a will. A will is *ipso facto* revoked by marriage; by a new will revoking the old one; or by the destruction of the will by the testator, or some person in his presence, with intent to revoke the same. A will speaks from the date of the testator's death, not from the date of the will. Thus, if A devises all his lands to B, the lands are ascertained at the testator's death, unless a contrary intention appears. A lost will, which is shown not to have been revoked, can be proved by oral evidence. All wills must be proved. If a will has an intelligible meaning, evidence that the testator meant something else will not be admitted; but if the will is ambiguous, evidence of the testator's intention is admissible. If words or changes are introduced into a will by accident, fraud, or mistake, without the testator's knowledge, they may be struck out. A devise may be void for uncertainty—e.g. a devise of some of my lands to A and some to B. By the Wills Act, 1861, a will made by a British subject out of the United Kingdom is good as to personal estate if it was made according to the forms either of the place where it was made, or of the place of the testator's domicile, or of his domicile of origin (being within the British

empire). Soldiers on active service, and seamen at sea, including merchant sailors, may, when they have attained the age of fourteen, make a will of personal property, without any formality, and either by word of mouth or in writing signed or unsigned. But by the Navy and Marines (Wills) Acts, 1865 and 1897, in the case of a seaman (not an officer or engineer) in the royal navy, a will of wages or prize-money payable by the Admiralty must comply with the Wills Act, and be attested by two officers, unless the testator is a prisoner of war, when the will must be attested by one officer or a notary public, or comply with the law of the place, or with the law of England; but the Admiralty may dispense with all formalities if they think fit.

In Scotland the word 'will' is not a technical legal term, but it is the popular name for any document by which a person legally disposes of his property after his death. Formerly, heritable property in Scotland could only be disposed of by a deed containing words of *de presenti* disposition, and a will, or testament (which is the technical term), could only dispose of movables. But by the Titles to Land Consolidation Act, 1868, sec. 20, heritable property can be disposed of by any testamentary or *mortis causa* deeds or writings. In England a man can freely dispose of his whole estate, real and personal, by will, without any regard to his wife or children; but in Scotland the widow has her *jus relictae*, being one-third or a half of the movable estate, according as there are children or not, and the children their *legitim*, being another third or a half, according as there is a widow or not, and the husband can only dispose by will of the remainder, or 'dead's part,' unless by antenuptial contract power is given him to dispose of more. In Scotland a holograph will, or a will in the handwriting of the testator, requires no witnesses, but it must be signed. A legatee may be a witness to a will without losing his legacy. The commonest form of testamentary disposition in Scotland is a trust disposition and settlement. See LEGACY, NUNCUPATIVE WILL, and TRUST; also Jarman *On Wills* (5th ed. 1893), Theobald's *Law of Wills* (6th ed. 1905), M'Laren *on Wills and Succession* (3rd ed. 1894).

Will, in psychology, means (1), when used in a wide sense, the whole impulsive or active side of consciousness. In the tripartite division of consciousness into intellect, feeling, and will, the term is so used. But psychologists are now inclining to use the more

vague and general word conation in this sense, and will is then employed in a narrower sense to denote (2) that phase of consciousness on its active side which immediately precedes the overt action or movement. But of course such deliberate action is not the only type of voluntary action. The hasty or impulsive action, as expressing the agent's conscious attitude at the time, is also voluntary, though no doubt a less adequate and reliable expression of his will than a more deliberate act would have been. The determination of the nature, limits, and degrees of the voluntary and the involuntary becomes in this connection a matter not only of theoretical or psychological interest, but of the most direct practical or legal importance. The classical discussion is that contained in book iii. of Aristotle's *Ethics*, where he defines all action as voluntary in which the agent is not hindered or compelled by external force, and is not misled by any inevitable ignorance or misapprehension as to the particular circumstances of the case. Psychologists of one school insist on regarding conation or will as a constituent or element in consciousness distinct from and not reducible to intellect and feeling, and some even regard will as the most fundamental characteristic of conscious process. The tendency, however, of the greatest philosophical thinkers has always been rather to minimize the distinction between intellect and will, and to regard the latter as intelligence directed to and expressed in action. This psychological question stands in close connection with the ethical and metaphysical controversy as to the freedom of the will. A great part of the difficulty of this controversy is unquestionably due to the confusion of several distinct issues under one vaguely conceived alternative of freedom or necessity. When we speak of a man as a free agent, we may mean simply that he is not withheld from action by any external cause—that he is neither a prisoner nor a slave, nor paralyzed, nor otherwise disabled. Next we may apply the term free to the internal or psychological decision, which he is externally free to carry out. In this sense the freedom of an action evidently consists in the fact that the action proceeds from the intelligent choice of the agent, and such choice is plainly and strongly contrasted with the mechanical determination which obtains in the physical world. But when the mechanical view is extended—as on account of its abstract simplicity it very naturally tends

to be—from the physical world, where it is appropriate, to mental process, where it is not, choice comes to be conceived as itself the outcome of a *psychical* mechanism, and the very contrast on which the whole meaning of freedom as applied to human action depends is obliterated. The confusion thus introduced into the discussion becomes complete when the defenders of freedom, instead of repudiating the mechanical analogy altogether, admit it as generally applicable, but reserve a mysterious faculty of will or volition to enable them to evade the logical consequences of their own admissions. Hence the futile controversy between a mechanical determinism on the one hand, and what is essentially a no less mechanical indeterminism on the other. The notion of freedom is further used in a sense which is not psychological at all, but ethical, when the good man is said to be free from the bondage of the lower nature, or the apostle's 'spiritual man', to be free from the bondage of the flesh and sin. And this is often characterized as the true freedom. From the new confusion between such moral freedom and freedom in the ordinary psychological sense, philosophers themselves have not been exempt, Kant's ethics in particular being much involved in it. Perhaps the best treatment of the whole subject is that given in T. H. Green's essay 'On the Different Senses of Freedom' (*Works*, vol. ii. 1885-8). Will is also used in a metaphysical sense in a system like Schopenhauer's to denote the world-principle, when conceived as being of a nature to which human will is analogous, or of which human will is a manifestation.

Willaert, ADRIAN (c. 1480-1562), founder of the Venetian school of musical composers, was born at Bruges in Belgium. In 1527 he was appointed music-master of St. Mark's, Venice. He was a prolific composer of motets and madrigals, and is regarded as the creator of the madrigal and the double chorus.

Willard, EDWARD S. (1853), English actor, made his first appearance on the stage at Weymouth (1869), and came to London (1881), when he took part in the performances of *The Lights of London*, *The Silver King*, *Hoodman Blind*, *The Roman Rye*, and *Jim the Penman*. He was manager of the Shaftesbury Theatre (1889-90), when he produced *The Middleman* and *Judah*; of the Comedy Theatre, when he played in *The Professor's Love Story* (1894); and of the Garrick Theatre (1895), when he gave *Alabama* and *The Rogue's*

Comedy. In 1903 he produced *The Cardinal* at the St. James's Theatre.

Willard, FRANCES ELIZABETH (1839-98), American author and reformer, born at Churchville, near Rochester, New York. She gave her early life to teaching, and became president of the Women's College at Evanston and professor of aesthetics in the university there. In 1874 she resigned this office to devote herself to temperance work. Her works include *Hints and Helps in Temperance Work* (1875); *Women and Temperance* (1883); *Women in the Pulpit* (1888); *My Happy Half-Century* (1894); *A Wheel within a Wheel* (1895); and *Do Everything* (1895). See Witts's *Frances E. Willard* (1898).

Willcocks, SIR JAMES (1857), British soldier, born in Delhi. He first saw service in the Afghan war of 1879-80, and afterwards took part in the Waziri expedition (1881), the Sudan campaign (1885), the Burmese expedition (1886-9), and the Chin-Lushai expedition (1889-90). He was with the punitive expedition to Manipur in 1891, and with the Tochi field force, under Sir W. Lockhart, in 1897. His next service was in Nigeria (1897-8). Two years later he was called upon to suppress the rebellion in Ashanti, and to relieve Kumassi, for which he was created K.C.M.G. He has published *From Cabul to Kumassi* (1904).

Willems, FLORENT (1823-1905), Belgian genre painter, born at Liège. In 1844, he exhibited his first success—*Visit to a Young Mother*—in Paris, and that city thereafter became his home. Among his works, mostly domestic scenes of the 16th and 17th centuries, may be mentioned *Three Ages of Man*, *Adorning the Bride*, *Lady with Lapdog*, and *Woman with the Spinning Wheel*. He also restored Raphael's *St. John the Baptist*.

Willemstad, tn., cap. of island of Curaçoa, Dutch W. Indies, on s. coast; has trade in sugar, tobacco, and phosphate of lime. Pop. 10,000.

Willet (*Totanus* or *Symphemia semipalmatus*), an American sandpiper, which occasionally strays to Europe.

William I., called the CONQUEROR (1027-87), king of England, was the son of Robert the Devil, Duke of Normandy, and of Arlette, the daughter of a tanner of Falaise, where he was born. He succeeded his father as duke in 1035, but was not thoroughly established in power until 1047. Edward the Confessor, his cousin, is said to have offered him the succession to the crown of England in 1051. In 1064 Harold of Wessex also rec-

ognized the Norman duke's pretensions to the English crown. When, however, Edward the Confessor died, Harold refused to be bound by a promise which, he said, was extorted from him, and seized the throne. In consequence of this, William invaded England, and defeated and slew Harold at the battle of Senlac. William then gradually forced all England to recognize his royal title. Till 1072 he was constantly engaged in putting down risings of the English, and in driving back Malcolm IV. of Scotland. At last, by thoroughly devastating the north of England; by inducing Hereward the Wake, who had held out on the Fens, near Ely, to make peace; and by forcing Malcolm IV. to submit at Abernethy (1072), William was able to regard the conquest of the country as completed. But in 1074 Roger, Earl of Hereford, and Ralph, Earl of Norfolk, rose, and inaugurated a struggle between feudalism and the crown, which lasted for a hundred years. The suppression of the revolt was followed by another rising in 1077, in which Robert, William's eldest son, took a leading part. In order to establish a strong centralized government, William reformed the church in England, and then increased its power and its independence of the barons by setting up separate ecclesiastical courts, and by introducing a number of able and learned administrators, such as Lanfranc, archbishop of Canterbury. As a further check on the barons, he kept up the hundred and the shire courts; he made the sheriffs royal officers, dependent on himself; he preserved the Anglo-Saxon *fyrð*; he caused Domesday Book to be drawn up; he compelled all land-owning men to take an oath of fealty to himself at Salisbury (1086). See Freeman's *History of the Norman Conquest* (1867-79) and *William the Conqueror* (1888).

William II., called **RUFUS** (?1056-1100), king of England, succeeded his father in 1087. He had ability, but his nature was unrestrained and savage. He had no respect for religion or for the church. William put down, in 1087, a rebellion headed by Odo, bishop of Bayeux, and in 1091 secured Normandy, which Robert, his elder brother, had sold to Henry, his younger brother. An invasion of England by Malcolm IV. (Canmore) led William to invade Scotland and to annex Cumberland, which he peopled with English and Flemings. A second invasion by Malcolm resulted in his death in 1093 at Alnwick. Meanwhile William had attempted the conquest of Wales, but had to content himself with building

castles on the Welsh frontier, and colonizing part of Southern Wales with French, Flemish, and English settlers. In 1095 a revolt of Robert of Mowbray, Earl of Northumberland, led to the capture of the castle of Bamborough, and the beginning of the policy of confiscation, which gradually lessened the power of the great nobles. William was equally successful in seizing Maine. A long quarrel with Anselm, the successor of Lanfranc, archbishop of Canterbury, arose out of the recognition of a pope. Though technically right, William damaged his cause by his violence and avarice, and Anselm left the country (1097). William was slain while hunting in the New Forest. See Freeman's *History of the Norman Conquest* (1867-79) and *The Reign of William Rufus* (1882).



William III. (England).
(The best portrait, when Prince of Orange.)

William III. (1650-1702), king of England, was the son of William II. of Orange, ruler of the United Provinces. In 1672 he helped to effect the deliverance of his country from the French. From that time he became the leading opponent of Louis XIV. and the principal supporter in Europe of the balance of power. In 1677 he married Mary, daughter of James, Duke of York, who in 1685 became king of England as James II. In 1688 William was invited by seven Whig peers to deliver England from the Stuart misrule. After the flight of James II. to France, the crown was offered to William and Mary. The Bill of Rights defined their powers, and the Mutiny Act made Parliament supreme. The battle of the Boyne (July 1, 1690), followed by the treaty of Limerick in 1691, ruined the chances of

James in Ireland, and the death of Dundee, who won the battle of Killiecrankie for James in 1689, ruined the Stuart cause in Scotland, though William's success was marred by the deplorable massacre of Glencoe in 1692. On May 19, 1692, the English naval victory of La Hogue ruined all chance of direct aid to James from France. On the Continent the French armies were successful. In August 1692 William III. was defeated at Steinkirk, and later at Landen. Though in 1695 William retook Namur, he could win no decisive victory against the French, and in 1697 England, France, Holland, and Spain agreed to the peace of Ryswick. In 1694 Queen Mary died. From 1697 to 1700 William was occupied with the Spanish Succession question, but died before the outbreak of the war. During his later years he had been opposed in Parliament, and had been obliged to cancel his grants of Irish lands to certain of his friends; the Whig leaders had been impeached; and in the Act of Settlement, passed in 1701, the Tories had imposed fresh checks on the royal power. In Scotland the failure of the Darien scheme had made the English government more unpopular than ever. William's reign marked the transition from the personal government of the Stuarts to the parliamentary rule of the Hanoverians. See Macaulay's *History of England*, Ranke's *History of England, principally in the 17th Century* (1859-67), and Traill's *William III.* (1888).

William IV. (1765-1837), king of England, was born at Windsor, the third son of George III., and succeeded his brother George IV. in 1830. He was popular with the nation owing to his genial and simple character, and his sympathy with Liberal principles. After a long struggle the Reform Bill was carried in 1832, though William IV. had latterly adopted an anti-reform attitude. The emancipation of the slaves, the renewal of the Bank Charter, the settlement of the East India Company, were all beneficial measures which marked the reign of William IV. The foreign policy of Lord Palmerston placed England in a foremost position among foreign nations. William IV.'s reign saw the ascendancy of the middle classes in England. In his early life William IV. lived with the actress Mrs. Jordan. See Spencer Walpole's *History of England* (1878-86), Buckingham's *Courts and Cabinets of William IV.* (1861), Greville's *Memoirs* (1875-87), and P. Fitzgerald's *Life and Times of William IV.* (1884).

William the Lion (1143-1214), king of Scotland, succeeded his brother Malcolm IV. in 1165, and

was a grandson of David I. Malcolm IV. had been compelled by the English king, Henry II., to give up Northumberland, Cumberland, and Westmorland, which David had held, and to acknowledge Henry's feudal superiority. William the Lion was in 1173 won over to the cause of the rebellious English barons by the offer of Northumberland. The rebellion, however, failed, and William was captured at Alnwick by the sheriff of Yorkshire. By the treaty of Falaise he was compelled to hold Scotland as a liegeman of the English king, and as security to hand over the castles of Edinburgh, Stirling, Roxburgh, Jedburgh, and Berwick. But Richard I., for 10,000 marks, restored the castles of Roxburgh and Berwick to William, and released him and his heirs from doing homage to the English kings. William built the abbey of Arbroath in 1178 in memory of Thomas à Becket.



William I., King of Prussia and German Emperor.
(Photo by Reichard & Lindner, Berlin.)

William I. (1797-1888), king of Prussia and German emperor, was the son of Frederick William III. of Prussia, and was born at Berlin. He first saw service in the war of liberation against Napoleon I., and for his gallantry in the 1814 campaign in France received the iron cross. His reactionary sympathies at the time of the revolution of 1848 in Berlin made him very unpopular, and he was compelled to take refuge in England. In 1858 the mind of the king, Frederick William, gave way, and Prince William became regent. In the beginning of 1861 William succeeded to the throne of Prussia. In September 1862 he called

Bismarck to office, and in 1863 the Schleswig-Holstein question came to the fore, and embittered the relations of Austria and Prussia. In 1866 the Austro-Prussian war broke out, and at the conclusion of the war the Prussian ascendancy in Germany was assured. The war of 1870-1 completed the triumph of William I. On Jan. 18, 1871, in the palace of Versailles, William was chosen German emperor. William's honesty and sagacity made him universally popular. See A. Forbes's *Life of the Emperor William* (1889), Oncken's *Das Zeitalter des Kaisers Wilhelm* (1892), Schmidt and Otto's *Kaiser Wilhelm und seine Zeit* (1888).

William II. (1859), king of Prussia and German emperor, was born at Berlin, and in 1888 succeeded his father, the Emperor Frederick III. From the day of his accession he resolved to be his own master, and in 1890 Bismarck was requested to resign his chancellorship. Anxious to extend the colonial possessions of Germany, William II. has lost no opportunity of entering upon the work of expansion, and this has had the effect of leading to a concentration of British energy in S. African affairs which it was largely the policy of the German government to prevent. These matters and later utterances by the emperor gave rise to much unfriendly feeling between the two countries, an estrangement which it has taken years to modify, and which is only now passing away. The collapse of Russia in her war with Japan has relieved Germany of all fear of a Russian attack, and has strengthened her position immensely in the political world. William II. is a great believer in the divine right of kings, and by temper and tradition is a thorough autocrat. His untiring energies are expended in many diverse ways. In addition to his great military and naval passions, he takes great interest in sport, is an excellent shot, a keen yachtsman, a preacher, a poet, and a painter, and has a lively enthusiasm for many branches of literature; while his striking and emphatically positive speeches show considerable rhetorical power. Perhaps the most useful work effected during the emperor's reign has been the formation of a powerful fleet, and he may well be termed the founder of the German navy. The growth of the Socialist Democratic party in Germany has caused him much anxiety. See Lowe's *The German Emperor* (1895); Nousseanne's *William II.* (1905); *William II. of Germany* (1904).

William the Silent, Prince of Orange (1533-84), son of the Count of Nassau, was born at

Dillenburg in Nassau, and succeeded in 1544 to the principality of Orange. Charles V. appointed him governor of Holland, Zealand, Utrecht, and West Friesland, and sent him on several diplomatic missions. Philip II. on his accession accused William of Orange of stirring up the States-general against the royal measures. In 1561 William definitely headed the opposition in the Netherlands to Philip, and urged the regent, Margaret of Parma, to carry out certain necessary reforms. In 1567 William retired to Nassau and watched the course of events. An attempt to overthrow the Spanish governor, Alva, failed, and the co-operation of the French with the rebels ceased after the massacre of St. Bartholomew in 1572. In 1578 William and the Archduke Matthias were defeated by the Spanish troops at Gembloux. William then induced the Roman Catholic provinces to make the union of Arras in January 1579, and to leave the Protestant provinces, which at once formed the union of Utrecht. But William was himself assassinated. He was a great man; and to his patience, perseverance, and skill, the Dutch republic, as the seven united provinces were termed, owed its independence. As a statesman and diplomatist he occupies a foremost place among his contemporaries. See Putnam's *William the Silent* (1896), and F. Harrison's *William the Silent* (1897).

William I. (1772-1843), king of the Netherlands, born at the Hague, the son of William V., the last hereditary stadtholder. He commanded the army of the Netherlands against France from 1793 until the subjection of the kingdom in 1795. After that he joined the army of Prussia, and served as a general until his capture by the French at Jena (1806). He also served in the Austrian army—e.g. at Wagram (1809). On the downfall of Napoleon, and the subsequent adjustment of European affairs, the Congress of Vienna decided that Belgium and Holland should be united under one sovereign, William I. He reigned till 1840, when he resigned in favour of his son William II.

William II. (1792-1849), king of the Netherlands. In the Napoleonic wars he fought with Wellington in Spain, and commanded the Dutch army at Waterloo. On the revolt of the Belgians (1830), he, contrary to the wishes of his father, acquiesced in the independence of Belgium. Two years later he commanded the army of the Netherlands against the Belgians, until defeated by the French (1832).

William IX. (1071-1127), duke of Aquitaine and count of Poitou, Provençal poet. He seized the territory of Raymond IV, when he was absent at the crusades; but he afterwards joined (1101) the crusaders himself, with the duke of Bavaria, but was entrapped by Alexis, emperor of Constantinople. William saved himself by flight, and took refuge with the prince of Antioch, whom he accompanied to Jerusalem. On returning home he assisted the king of Aragon against the Moors, over whom a victory was obtained at Cordova. He afterwards assisted Louis the Fat in his campaign against the Germans (1124). He was also a celebrated Provençal poet. His *Poésies* are printed in Mahn's *Die Werke der Troubadours*, vol. i. (1846). See Palastre's *Histoire de Guillaume IX., dit le Troubadour* (1882).

William of Champeaux (d. 1121), French scholastic philosopher, was born at Champeaux, near Melun. He studied at Paris, where he formed a school, among his pupils being Abelard. In 1113 he was made bishop of Châlons-sur-Marne. He wrote several theological works.

William of Jumièges. See JUMIÈGES.

William of Lorris. See LORRIS, GUILLAUME DE.

William of Malmesbury. See MALMESBURY.

William of Nassau. See WILLIAM THE SILENT.

William of Newburgh (1136-?98), English historian, was born in Yorkshire, and spent all his life at the Augustinian monastery of Newburgh. He is the author of the best historical work left to us from the 12th century, and the spirit of it is manifest from his denunciation of the fables set forth by Geoffrey of Monmouth. Although his dates are not to be accepted without corroboration, he well deserves Freeman's praise as 'the father of historical criticism.' Editions of his *History* appeared in the Rolls Series (1884), and for the English Historical Society (1856).

William of Occam. See OCCHAM.

William of Orange. See WILLIAM THE SILENT, and WILLIAM III. OF ENGLAND.

William of Poitiers (c. 1020), chronicler. After acting as chaplain to William the Conqueror, he was appointed archdeacon of Lisieux, and devoted himself to philosophy, mathematics, and history—especially to the compilation of his *Gesta Guillelmi Ducis Normannorum et Regis Anglorum*.

William of Shoreham, English religious poet, was born at Shoreham, and became a monk of the priory of Leeds and vicar of

Chart-Sutton (1320). He translated the Psalms of David into English prose about 1327, and wrote a number of religious poems, edited for the Percy Society in 1849 by Thomas Wright, and for the Early English Text Society by Konrath in 1902. See Konrath's *Beiträge zur Erklärung und Text-Kritik des W. von Schorham* (1878).

William of Tyre (c. 1137-83), mediæval historian, was English

Glamorganshire, and became a land-surveyor. He is known by his bardic name of Iolo, and was active in the collection and publication of Welsh MSS.—*Myvyrian Archaeology* (1801), and *Iolo MSS.* (1848).

Williams, Sir George (1821-1905), English philanthropist, was born at Dulverton, Somersetshire. In 1841 he went to London and entered into business at St. Paul's Churchyard, where he remained



William II., King of Prussia and German Emperor.
(Photo by Reichard & Lindner, Berlin.)

by birth. After being prior of the Holy Sepulchre at Jerusalem, he was consecrated (1175) archbishop of Tyre. His *Historia* was translated into French (ed. by P. Paris, 1879-80).

William of Wykeham. See WYKEHAM.

William and Mary College, at Williamsburg in Virginia, U.S.A., received a charter (1693) from William and Mary.

Williams, Edward (1746-1826), Welsh bard, was born in

for over sixty years. He was the originator of the Young Men's Christian Association in 1844, and in the development of which, and in that of the Band of Hope Union, his great interests lay. It was owing to his efforts that Exeter Hall was acquired for the Y.M.C.A. headquarters. In memory of the founder, his house, 13 Russell Square, London, was offered by his sons to the National Council of the Y.M.C. Associations as the future headquarters

of the movement, which offer was accepted (July 1906). Williams was knighted in 1894.

Williams, ISAAC (1802-65), Welsh poet and theologian, was born near Aberystwith, and became (1831) fellow of Trinity College, Oxford. His poems and prose writings are chiefly devotional, among the former being *The Cathedral*, *The Christian Seasons*; and among the latter, *Devotional Commentary on the Gospel Narratives*, *The Apocalypse*, and sermons. Williams's religious views were of the Tractarian school, and he was the author of the celebrated tract, *Reserve in communicating Religious Knowledge*. See his *Autobiography* (1892).

Williams, JOHN (1796-1839), English missionary, was born at Tottenham, near London, and in 1816 accepted by the London Missionary Society as a missionary to the Society Is. in the Pacific. Here Williams introduced a code of laws, encouraged the cultivation of the sugar-cane and tobacco, and instructed the natives in printing and in house-building. This missionary work was also extended to the Cook Is., to Rarotonga (Harvey Is.), to Samoa, and to the Friendly Is. He was killed on the cannibal island of Erromanga (New Hebrides). He wrote *Narrative of Missionary Enterprises in the South Sea Islands* (1837). See Prout's *Memoir* (1843), and Campbell's *Martyr of Erromanga* (1842).

Williams, SIR MONIER MONIER (1819-99), English Orientalist, was born at Bombay; was professor of Oriental languages at Haileybury (1844-58); taught Sanskrit at Cheltenham (1858-60); and became Boden professor of Sanskrit at Oxford (1860). He was fellow of Balliol College, Oxford (1882-8); keeper and curator of the Indian Institute (1883) at Oxford; and was knighted in 1887. His *Sanskrit Dictionary* (1851-72), and edition of *Sakuntala* (1853), *Indian Epic Poetry* (1873), and *Indian Wisdom* (1875), are of high authority. He also wrote *Religious Life and Thought in India* (1883), and on Buddhism (1889), Brahmanism (1889), Hinduism (1877, 1889).

Williams, ROGER (?1600-83), founder of the state of Rhode I., U.S.A., and the apostle of civil and religious liberty in America, was born in Wales. He became a nonconformist minister, and sought an asylum in America, in 1681, and became an assistant minister at Salem, and later at Plymouth. In 1633 he became chief pastor at Salem, but was driven from his charge for his 'new and dangerous opinions against the authority of magistrates.' He then founded the

city of Providence, Rhode I. Here he became a Baptist, and founded a church. In 1643 he sailed for England to procure a charter, and in 1651 again visited England to secure the confirmation of his charter, and then became intimate with Vane, Milton, and Cromwell. In 1654 he returned as president of the colony of Rhode I., an office which he held till 1658. He wrote *Key into the Language of the Indians of America* (1643), *The Hiveling Ministry none of Christ's* (1652), and *Experiments of Spiritual Life and Health* (1652). His *Works* were published in 6 vols. in 1866-74. See *Life* by Guild (1866) and Dexter (1876), and Guild's *Account of the Writings of Roger Williams* (1862).

Williams, ROWLAND (1817-70), Welsh Anglican divine, was born in Flintshire. Whilst vice-principal and professor of Hebrew at St. David's, Lampeter (1850-62) he organized many reforms. He is the author of the standard work *Christianity and Hinduism* (1856). His *Rational Godliness after the Mind of Christ* (1855), a 'Review of Bunsen's Biblical Researches' in *Essays and Reviews* (1860), and *Broad Chalke Sermon-Essays* (1867), all set forth the liberality of his doctrinal views, which brought against him accusations of heresy. See *Life and Letters*, by his wife (1874).

Williams, SAMUEL WELLS (1812-84), American Orientalist, born at Utica, New York, and went to China (1833) as a printer for the missionary board at Canton. He learned Japanese, and made a version of Genesis and St. Matthew into that language. He wrote *Easy Lessons in Chinese* (1841), *An English and Chinese Vocabulary* (1843), *A Chinese Commercial Guide* (1844), *The Middle Kingdom* (1848), and *Tonic Dictionary of the Chinese Language* (1856). In 1858 he assisted in the negotiations at Tientsin.

Williams, SIR WILLIAM FENWICK (1800-83), British general, was born at Annapolis, Nova Scotia. In 1854, on the outbreak of the Crimean war, he was appointed British commissioner with the Turkish army in Asia Minor, and practically became its commander-in-chief. He was besieged in Kars by the Russians from June 7 till Nov. 28, 1855, when he capitulated with the honours of war. He was created a baronet in 1856, and made a general in 1868.

Williams, WILLIAM MATTIEU (1820-92), English writer on science, was born in London, and established himself as an electrical instrument maker. He lectured on scientific subjects, became an authority on paraffin

and illuminants, and for a time was manager of a Welsh oil company. He published various works of a popular scientific character, but regarded a *Vindication of Phrenology* (1894) as his magnum opus.

Williamsburg, tn., cap. of James City co., Virginia, U.S.A., between the James and York Rs., 48 m. S.E. of Richmond; has oyster fishing. It was the seat of the government of Virginia (1705-9). It contains the William and Mary College (1693) and the E. State lunatic asylum. Pop. (1900) 2,044.

Williams College, at Williamstown, Massachusetts, U.S.A., was founded (1793) in accordance with the will of Colonel Ephraim Williams. It is under Congregational control, and has always been famed for its teaching of science, the first observatory erected in the United States having been placed here in 1838.

Williamson, ALEXANDER WILLIAM (1824-1904), English chemist, was born at Wandsworth, London, and studied chemistry, first under Gmelin at Heidelberg, and afterwards with Liebig at Giessen. In 1849 he was appointed professor of practical chemistry in University College, London, succeeded Graham in the chair of chemistry there in 1855, and retired in 1887. Williamson's principal work was in extending the theory of types, and on the theories of etherification and electrolysis. He also did good service in pointing out the vital importance of a scientific education. He was foreign secretary of the Royal Society (1873-89).

Williamson, FRANCIS JOHN (1833), English sculptor, born at Hampstead, near London, was assistant to J. H. Foley for twenty years. He has executed busts or statues of nearly every member of the royal family; also statues of Queen Victoria for London, Australia, and India, the memorial to Princess Charlotte at Clarence House, and the memorial to Dean Milman in St. Paul's Cathedral—one of his best works.

Williamson, PETER (1730-99), Scottish author and publisher, was born at Aboyne in Aberdeenshire, and when ten years of age was kidnapped and sold in the plantations in America. After he became his own master he was captured by Indians, escaped and enlisted in the British army, and in 1757 was discharged at Plymouth. He published an account of his experiences, and settled in Edinburgh as bookseller, printer, and tavern-keeper. He issued (1776) a periodical in the style of the *Spectator*, called the *Scots Spy*, and the first street Directory of Edinburgh (1773). He also instituted a penny post,

which was ultimately taken over by the government (1793).

Williamson, WILLIAM CRAWFORD (1816-95), English naturalist, was born at Scarborough, and became curator of the museum of the Manchester Natural History Society (1835). Having qualified in medicine, he devoted himself specially to aural surgery. In 1851 he was appointed professor of natural history in Owens College, Manchester, and held the post till 1892. The studies of the fossil plants of the Coal Measures, published in *Phil. Trans. of Royal Society* (1871-93), are the work by which his fame was established. See his autobiographical *Reminiscences of a Yorkshire Naturalist* (1896).

Williamsport, city, Pennsylvania, U.S.A., co. seat of Lycoming co., on the w. branch of the Susquehanna, 70 m. N. from Harrisburg. The principal manufactures are lumber, rubber, silk, and clothing. Pop. (1900) 28,757.

Willibald, ALEXIS. See HÄRING, G. W. H.

Willibrord, SAINT (657-736), apostle to the Frisians, was born in Northumbria, and spent twelve years (677-690) in an Irish monastery, until sent in 690 to preach to the Frisians. See *Life* by Alberdingk-Thijm (1863).

Willimantic, tn., Windham co., Connecticut, U.S.A., 25 m. E.S.E. of Hartford; has manufactures of cotton thread, paper, silk and woollen goods. Pop. (1900) 8,937.

Willis, NATHANIEL PARKER (1803-67), American author, born at Portland, Maine; first attracted notice with his *Pencilings by the Way* (1831). He contributed as foreign correspondent to the *New York Mirror* (1835). His *Slingsby Papers*, republished as *Inklings of Adventure* (1836), added to his fame. While in England he published a volume of verse, *Melaine and other Poems* (1835), which achieved success. His most notable works are *Life Here and There* (1850), *Outdoors at Idlewild* (1854), *Paul Fane* (1857). His collected *Poems* appeared in 1867, and a selection from his *Prose Writings* in 1885. See *Life* by H. A. Beers (1885). His sister, SARAH PAYSON WILLIS (1811-72), under the nom de plume of 'Fanny Fern,' wrote sketches and books for the young. See *Memorials of Fanny Fern* (1873), by J. Parton.

Willis, ROBERT (1800-75), English inventor and archæologist, was born in London. He became Jacksonian professor of applied mechanics in Cambridge University (1837). Among his principal works are *System of Apparatus* (1851); *Principles of Mechanism* (2nd ed. 1870); *Remarks on the Architecture of the Middle Ages*

(1835); *The Architectural History of the Monastery of Christchurch, Canterbury* (1869), and histories of many of the English cathedrals. He left incomplete an *Architectural History of the University of Cambridge and of the Colleges of Cambridge and Eton*, completed (4 vols.) by J. W. Clark (1886). Willis was the inventor of the cymagraph and the odontograph.

Willis, THOMAS (1621-75), English physician, was born in Wiltshire. He practised at first in Oxford, where he was a zealous churchman and king's man during the whole period of the rebellion. In 1660 he was appointed professor of natural philosophy, and in 1666 settled in London to practise medicine. In 1664 he published the results of his anatomical studies, giving the most exact account of the nervous system which had then appeared, and by his urine analysis he is credited with the discovery of diabetes mellitus. In 1682 a collected edition of his Latin works was published.

Willis's Rooms. See AL-MACK'S.

Will-o'-the-Wisp, or IGNIS FATUUS, a luminous meteor, generally of a pale bluish colour, seen over marshes and graveyards; it is supposed to be due to gases emanating from decaying vegetable or animal matter. Other names are 'Jack-a-lantern' and 'corpse candle.'

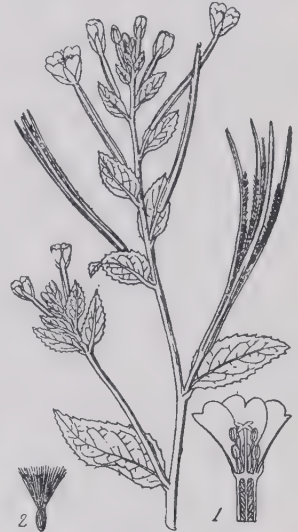
Willoughby, suburb of Sydney, N.S.W., Australia, 5 m. N.; with market gardens, cornflour mill, tanneries, and potteries. Pop. (1901) 6,006.

Willoughby, or WILLUGHBY, FRANCIS (1635-72), English naturalist, was born in Warwickshire. In company with Ray he made a long scientific sojourn on the Continent (1663-5). The result of his studies was published posthumously by Ray as *The Ornithology of Francis Willoughby* (1678), *Historia Piscium* (1686), and (completed by Ray) the *Historia Insectorum* (1710). Ray's posthumous *Synopsis Methodica Avium et Piscium* (1713) is also largely based on Willoughby's work.

Willoughby, SIR HUGH (d. 1554), English navigator, was chosen in 1553 to lead a trading expedition to China on behalf of the Company of Merchant Adventurers. He had with him Richard Chancellor, and chose the north-east route, but perished with his crews on the coast of Lapland.

Willow, a name given to a number of species of trees, many of which are natives of Britain. They are mostly characterized by their smooth, polished bark; by their long, slightly-notched leaves; and by their silky, erect,

barren catkins. They grow readily and rapidly from cuttings. The goat willow, or sallow, grows to some forty feet in height, and bears a profusion of handsome catkins in spring. The Bedford, or Russell's, willow is a large-growing species, and is very quick in attaining to maturity. The white, or Huntingdon, willow is also a very rapid grower. Willows thrive in moist ground, especially by the sides of rivers or ponds. They are grown for sheltering purposes in districts bordering on the sea—notably at Blackpool and Southport.



Willow Herb.

1, Flower, section; 2, seed.

Willow Herb, a term applied to certain plants belonging to the order Onagraceæ. Among the species native to Britain is the great hairy willow herb, which occurs commonly in wet situations. It grows to six feet in height, and has woolly or downy stems and leaves. In late summer it bears large rose-coloured flowers. The small-flowered hairy willow herb is also common. The broad smooth-leaved willow herb is generally found on dry ground or hilly places. It is quite a small plant, with dentate ovate leaves and rose-coloured flowers, followed by long, valved capsules, containing bearded seeds.

Willow Moth (*Caradrina quadripunctata*), a member of the British Noctuidæ, whose caterpillar attacks grain.

Willow-wren. See WARBLERS.

Wills, WILLIAM GORMAN (1828-91), Irish dramatist, born at Kilmurry, and in 1862 settled in

London, where he took to portrait-painting; but was more successful when he turned his attention to the drama. His best known plays are *Charles I.* (1872), *Eugene Aram* (1873), *Marie Stuart* (1874), *Sappho* (1875), *Jane Shore* (1876), and *Olivia* (1873), the first and last of which found a permanent place in the Lyceum theatre repertory. The only other of his plays that stand out at all prominently are *Claudian* (1883) and a version of *Faust* (1885), the latter revived in 1902. He was considerably gifted with the dramatic instinct. There is a *Life* by his brother (1898).

Wills, WILLIAM JOHN (1834-61), Australian explorer, was born in Devonshire, England, and in 1853 emigrated to Australia. He became connected with the Crown Lands Department, and in 1860 was appointed a member of a scientific exploring expedition sent out under Robert O'Hara Burke to discover a route to the north across Australia. The expedition left Melbourne in 1860, crossed the Australian continent to the Gulf of Carpentaria, but Wills and all the other members of the expedition, except King, died of starvation whilst trying to return to Adelaide. His *Journal* was edited by his father (1863).

Wills's Coffee House, London, a famous convivial resort, was in Russell Street, at the end of Bow Street. It first bore the title of the Red Cow, then of the Rose. Dryden was the first to make Wills's the resort of the wits of his time, and it was for long the open market for libels and lampoons. After Dryden's death (1700) the house was patronized by, among others, Pope. About 1712 the custom was transferred by Addison to Button's coffee house, on the opposite side of the street. See *Timbs's Club Life in London*, vol. ii. (1866).

Wilmington. (1.) City, Delaware, U.S.A., co. seat of Newcastle co., 28 m. s.w. of Philadelphia. It manufactures leather, machinery, railway carriages, iron and steel goods, and has shipbuilding. Pop. (1900) 76,508. (2.) City, N. Carolina, U.S.A., co. seat of New Hanover co., on Cape Fear R., 30 m. from the Atlantic; is one of the shipping ports of the south, whence over £2,000,000 of cotton is exported annually. Pop. (1900) 20,976.

Wilmot, DAVID (1814-68), author of 'the Wilmot proviso,' born in Bethany, Pennsylvania, and practised law at Towanda. Elected a member of Congress, while a bill was pending to apply two million dollars for the purchase of a part of Mexico, he moved (Aug. 8, 1846) an amend-

ment, 'That...neither slavery nor involuntary servitude shall ever exist in any part of said Mexican territory.' This was adopted by Congress, but rejected by the Senate. Wilmot was appointed (1863) a judge of the United States Court of Claims.

Wilna. See VILNO.

Wilson, ALEXANDER (1766-1813), Scottish ornithologist, was born at Paisley. Brought up as a weaver, he was fonder of books and nature. Going to America in 1794, he, as weaver, peddler, and sometimes schoolmaster, made a precarious livelihood for about eight years, but collected specimens of the rare birds of America. In 1808-13 he published his *American Ornithology*, the plates of which were all drawn, etched, and coloured by his own hand. The book was continued by C. L. Bonaparte (1828-33); new ed. by Sir W. Jardine (3 vols. 1832). See *Lives* by Ord (1828) in Jared Sparks's *American Biography* (1851), and A. P. Paton (1863).

Wilson, ANDREW (1831-81), Scottish traveller. Going to India, he edited the *Bombay Times*, and made a journey of exploration in Baluchistan. After that he went to China as editor of the *China Mail*, and travelled extensively there and in Tibet, of which he published an account, *The Abode of Snow* (1875). He was a friend and admirer of General Gordon, of whose Chinese campaigns he wrote a history in *The Ever Victorious Army* (1868).

Wilson, SIR CHARLES RIVERS (1831), president since 1895 of the Grand Trunk Ry., Canada; became a clerk in the Treasury (1856), and after acting as private secretary to Disraeli and Lowe, became secretary to the Royal Commission on International Coinage (1863). He was comptroller-general of the National Debt Office (1874-94), and finance minister in Egypt (1878-9).

Wilson, SIR CHARLES WILLIAM (1836-1905), British general, was born at Liverpool; became secretary to the boundary commission between Canada and the United States (1858-62), and did excellent work for the Palestine Exploration Fund (1864-6). He acted as head of the Intelligence Department in the Sudan (1884-5), and made a desperate effort to reach Khartum. He also served on the Ordnance Survey of Scotland and Ireland (1876-86), and was director-general of the Ordnance Survey of England (1886-94). Among his works are *Notes on the Ordnance Surveys of Palestine* (1865) and *Sinai* (1869), *Picturesque Palestine* (1880), *From Korti to Khartum* (1885), *Life of Lord Clive*

(1890), and *Murray's Handbooks to Constantinople* (new ed. 1900) and *Asia Minor* (1895).

Wilson, SIR DANIEL (1816-92), Scottish archaeologist and educationist, was born in Edinburgh, and adopted a literary career in London (1837), whence he returned to Edinburgh (1842), and published there his *Memorials of Edinburgh in the Olden Time* (1847; new ed. 1892), and *Prehistoric Annals of Scotland* (1851; 2nd ed. 1863). In 1853 he was appointed professor of history and English literature in Toronto University, becoming president of the institution in 1881, and was knighted (1888). In Canada he issued *Prehistoric Man* (1862; 2nd ed. 1876), *The Right Hand Left-handedness* (1891), and *Anthropology* (1885).

Wilson, GEORGE (1818-59), Scottish chemist and author, was born in Edinburgh, brother of Sir Daniel Wilson. He was in 1840 licensed as the first extra-mural lecturer in chemistry, and in 1855 became curator of the Industrial Museum, and professor of technology in Edinburgh. His *Researches on Colour Blindness* (1855) and his *Life of Cavendish* (1851) are notable. He issued also *Religio Chemici* (1862) and *Counsels of an Invalid* (1862), essays of a religious character. See *Memoir* by his sister (1862).

Wilson, HENRY (1812-73), American statesman, born at Farmington, New Hampshire. His real name was Jeremiah Jones Colbath, but in 1833 he got it changed to Henry Wilson. He was returned to the state legislature first as a Whig, but in 1855 he was sent to the Senate by the Democrats and Free Soil party, and retained his seat there till his death. During the civil war he was chairman of the Military Committee. He was nominated as vice-president of the United States with Grant in 1873, but died a few months after his election. He was the author of *Anti-Slavery Measures in Congress* (1864), *Military Measures in Congress* (1868), *History of the Rise and Fall of the Slave Power in America* (3 vols. 1872-5). See *Life* by Nason (1872).

Wilson, HERBERT WRIGLEY (1866), English author and journalist, born at Linthwaite, Yorkshire; was for some time editor of the *Daily Mail*. Among his publications are *Ironclads in Action* (5th ed. 1897), *Nelson and his Times* (with Sir Charles Beresford, 1898), *When War Breaks Out* (with Arnold White, 1898), *The Downfall of Spain* (1900), *With the Flag to Pretoria* (1900-01), *After Pretoria* (1902), *Mr. Chamberlain's New Policy* (1903), *Japan's Fight for Freedom* (1905),

Wilson, HORACE HAYMAN (1786-1860), English Orientalist, was born in London, and on his arrival in India (1808) was appointed assistant at the Mint, where in 1816 he became master. He published his first Sanskrit work in 1813, followed in 1819 by his *Sanskrit-English Dictionary*, which remained the standard work till 1875. In 1832 he was appointed Boden professor of Sanskrit at Oxford, and in 1836 librarian to the East India Company. Among his other works are *Account of the Religious Sects of the Hindus* (1828-32), *Select Specimens of the Theatre of the Hindus* (1827), and *History of British India from 1805 to 1835* (1844-8). His *Collected Works* appeared in 13 vols., in 1861-7.

Wilson, JAMES (1805-60), Scottish economist and politician, was born at Hawick. He settled in London as a hat manufacturer, and retired in 1844. Three works brought him reputation—one on the *Corn Laws* (1839), one on the *Currency* (1840), and one on the *Reform of Taxation* (1841); and when in 1843 he founded the *Economist*, he became a recognized power. In 1847 he entered Parliament as member for Westbury, and was a member of the Russell, Aberdeen, and Palmerston administrations, till in 1859 he went to India as financial member of the council, and effected great reforms.

Wilson, JAMES GRANT (1832), American author and editor, born in New York; founded (1857) and edited the *Chicago Record*, and edited Halleck's *Poems* (1868), *History of the City of New York* (1892-3), Appleton's *Cyclopædia of American Biography* (1901), and *Memoirs of an American Lady* (1901). He wrote *Sketches of Illinois Officers* (1862), *Pepsy and his Diary* (1867), *Love in Letters* (1896), *Life of Halleck* (1869), *Poets and Poetry of Scotland* (1876), *Bryant and his Friends* (1886), *Life of General Grant* (1897), *The Presidents of the United States, 1789-1901* (1901), and *Thackeray in the United States* (1903).

Wilson, JOHN (1785-1854), known as 'Christopher North', Scottish author, was born at Paisley. His poem on the *Study of Greek and Roman Architecture* won the Newdigate prize at Oxford in 1806. Having succeeded to a fortune of £50,000, he settled at Ellerray on Lake Windermere, Westmorland, attracted thither by admiration for Wordsworth. In 1817 he became associated with *Blackwood's Magazine*, which owed its brilliant success very largely to him and his friend Lockhart. In 1820 he was appointed professor of moral philosophy in Edinburgh University.

In 1851 he retired. Wilson published in 1812 his exuberant poem, *The Isle of Palms*, following it in 1816 with the vivid and occasionally powerful *City of the Plague*. His highest poetical touch is in *Unimore: a Dream of the Highlands*. His *Collected Works* were edited by Ferrier, in 12 vols. (1855-8). Two of the volumes constitute an attractive miscellany of descriptive essays and literary criticism under the general title *Recreations of Christopher North*. Under this pseudonym Wilson figured as the irresistible protagonist and 'Old Man Eloquent' of *Blackwood*. *The Noctes Ambrosianæ*, in four volumes, are ostensible records of symposia at Ambrose's Tavern, Edinburgh, at which North gathers around him such satelites as the glorified 'Ettrick Shepherd', 'Timothy Tackler' (Wilson's uncle, Robert Sym), the 'English Opium-eater' (De Quincey), and others. The dialogues display high spirits and reckless humour, hearty criticism of current literature and politics, and felicitous descriptive passages in the Scottish tongue. Sir John Skelton's *Selections* (1876) only imperfectly represent these remarkable feasts. A second abridgment of the work by Joanna Scott Moncrieff appeared in 1904. Four volumes of *Essays* include some fine descriptive writing, as in the article on 'Streams'; a valuable disquisition on Burns—one of the best estimates ever given of the poet; and a charming survey and exposition on 'Homer and his Translators.' Some of Wilson's short tales in *The Lights and Shadows of Scottish Life* (1822) are deep and true, but in these and in *The Trials of Margaret Lindsay* (1823), and *The Foresters* (1825), the sentiment tends to be overdone. Mrs. Gordon, Wilson's daughter, published *Christopher North: a Memoir of John Wilson* (1862).

Wilson, JOHN (1804-75), Scottish missionary and Oriental scholar, was born in Berwickshire, and sailed for India as a missionary in 1828. In that capacity he was distinguished by his zeal for female education, and for the study of native languages. He published in 1843 *The Parsi Religion Unfolded*, and in 1858 *India Three Thousand Years Ago*. See *Life* by George Smith (1878).

Wilson, JOHN MACKAY (1804-35), author of the *Tales of the Borders*, was born at Berwick-on-Tweed, and became a popular lecturer on literature, and finally editor of the *Berwick Advertiser* (1832). The *Tales of the Borders*, begun in 1834, won him instant popularity. He issued in all forty-eight numbers, the series

being continued after his death by his brother.

Wilson, RICHARD (1714-82), English landscape painter, born at Penegoes, Montgomeryshire. Until his thirty-sixth year he supported himself by portraiture; but going (1749) to Rome, he accidentally discovered his real vocation to be landscape-painting. His masterly landscapes are poetical compositions, with a power of generalization, imbued with classic sentiment, beautiful in colour and atmospheric effects. After his return to England, in 1757, he enjoyed some success, and was one of the original members of the Academy at its foundation in 1768. The National Gallery contains his *Niobe*, the best known of his works; *Mæcenæ's Villa*; *The River Wye*; and *Lake Avernus*, a picture which influenced Turner. See *Some Account of the Life of Richard Wilson*, by T. Wright (1824); and *Memoirs*, by Hastings (1825).

Wilson, SIR ROBERT THOMAS (1777-1849), British general, was born in London. He saw service in the Low Countries in 1794, and was through the rebellion in Ireland (1798). After more fighting in the Low Countries, he joined the forces in Egypt under Abercromby, and was present at the battle of Alexandria (1801). In 1806 he was present at the capture of the Cape of Good Hope from the Dutch. In 1812 he accompanied the Russian army as British commissioner. In 1813 he was attached in a similar capacity to the army of Austria. In 1818 he entered Parliament, and there in 1822 vindicated his partisanship for Queen Caroline, for which he had been dismissed from the army in 1821. He was reinstated on the accession of William IV. See his *Private Diary* (1861), and *Life* by H. Randolph (1863).

Wilson, THOMAS (? 1525-81), English statesman and scholar, was born in Lincolnshire, and at Cambridge came under the influence of the new learning, as represented by Cheke, Smith, and Ascham. He published (1552) a treatise on logic, *The Rule of Reason*, and (1553) *The Arte of Rhetorique*. He attached himself to the fortunes of the Dudleys, and endured exile with them; and at Rome (1557) he suffered imprisonment as a heretic. In 1560 he returned to England, and found employment as diplomatic agent to Portugal (1567), and in the Netherlands (1574-7), and in 1579 became secretary of state. He translated Demosthenes, and wrote a *Discourse on the Kingdom's Perils* (1578) and a *Discourse upon Usurye* (1572).

Wilson, THOMAS (1663-1755), English prelate, was born in

Cheshire, and became chaplain to the Earl of Derby, from whom in 1697 he received the bishopric of Sodor and Man, and built new churches, established parochial libraries, and translated works of devotion into Manx—his Manx Catechism (*i.e.* *Principles and Duties of Christianity*, 1707) being the first book published in that language. He also wrote

founded a chair of dermatology in the Royal College of Surgeons, of which he was the first occupant. In 1881 he was knighted. To his teaching is largely due the popularity of the Turkish bath. He defrayed the expense of bringing the Cleopatra's Needle from Alexandria to London.

Wilson Steamship Line, established in 1834 by the late

Wilton, mrkt. tn., munic. and parl. bor., Wiltshire, England, 3 m. W.N.W. of Salisbury; is the place where carpets were first manufactured in England. It was the capital of Wessex, and the seat of a bishopric till 1050. It gave name to the county. Sir Philip Sidney wrote part of his *Arcadia* in Wilton House, the seat of the Earls of Pembroke, which was built on the site of the ancient Wilton abbey. Pop. (1901) 2,203.

Wiltshire, inland co., S.W. England; hilly throughout the greater part. Towards the s. is Salisbury Plain (20 m. by 16 m.), about 400 ft. high, bordered on N. by the North Downs. North-east are the Marlborough Downs. The principal rivers are the Bristol Avon and the Salisbury Avon. Canals are the Thames and Severn, Wilts and Berks, in the N., and Kennet and Avon canal in the centre. Dairy-farming is important. Manufactures include broad-cloths (Trowbridge), carpets (Wilton). The county returns five members to Parliament. Wiltshire is noted for antiquarian remains—the Druidic circles of Stonehenge and Avebury; earthworks (Wansdyke); ancient camps and barrows; monastic remains (Malmesbury, Laycock); castles (Devizes, Old Sarum). A large tract of Salisbury Plain has been acquired by government for military purposes. Area, 864,105 acres. Pop. (1901) 273,869.

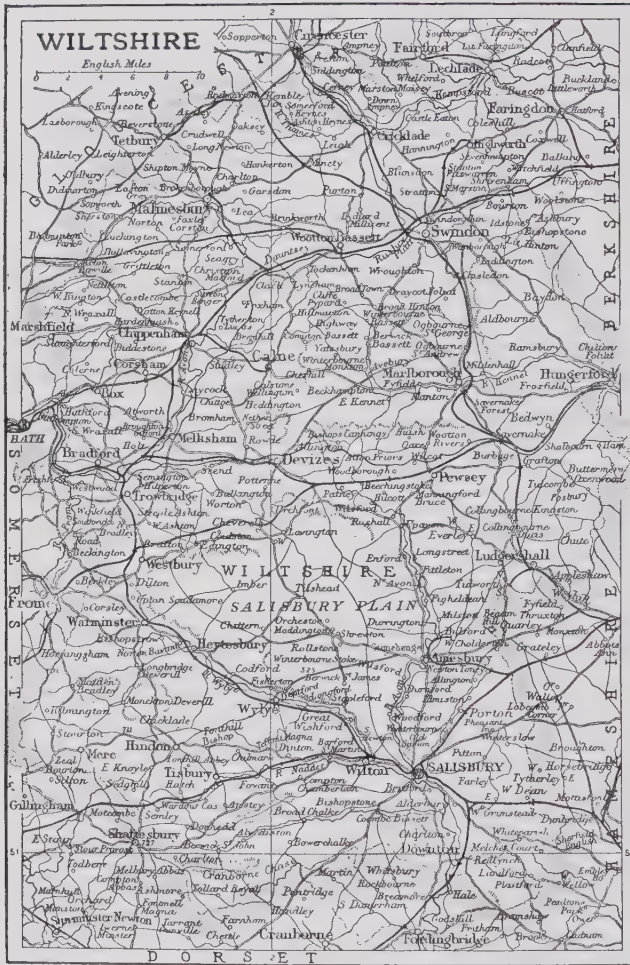
Wimbledon, munic. bor. (1905) and residential dist., Surrey, England, 7 m. S.W. of London. Wimbledon Common (about 1,000 ac.) was from 1860 to 1889 the meeting-place of the annual competitions of the National Rifle Association, now transferred to Bisley. An ancient earthwork is traditionally ascribed to Cæsar. Pop. (1901) 41,652.

Wimborne Minster, mrkt. tn., Dorset, 6 m. N. of Poole. The minster (12th to 15th century) contains a 14th-century orrery clock, and library with chained books. Pop. (1901) 3,696.

Wimshurst, JAMES (1832-1903), inventor of an 'influence,' or electrostatic machine, was born in London, and acted for some years as surveyor for Lloyds, and afterwards, till 1899, for the Board of Trade. He demonstrated the possibility of dispersing and reflecting the Röntgen rays.

Wimshurst Machine. See ELECTROSTATIC MACHINES.

Winchelsea, tn. and Cinque port, Sussex, England, 8 m. N.E. of Hastings. Old Winchelsea, an important seaport in Saxon times, was submerged in the 13th century. The church contains 14th-century tombs. Pop. (1901) 157.



Short and Plain Instructions for ... the Lord's Supper (1736). His Works were edited by Keble in 7 vols. (1847-63), with Life.

Wilson, SIR WILLIAM JAMES ERASMUS (1809-84), English surgeon, was born in London; appointed assistant to the Quains at University College, London (1831). About 1840 he devoted himself more especially to the treatment of skin diseases, and in 1869

Thomas Wilson, and converted into a private company in 1891. It has a fleet of ninety-two steamers, aggregating 190,439 tons, running between Hull and ports in Norway, Sweden, Denmark, Germany, France, and Russia, the Baltic, Mediterranean, Adriatic, and Black Seas, Bombay, Karachi, Boston, and New York.

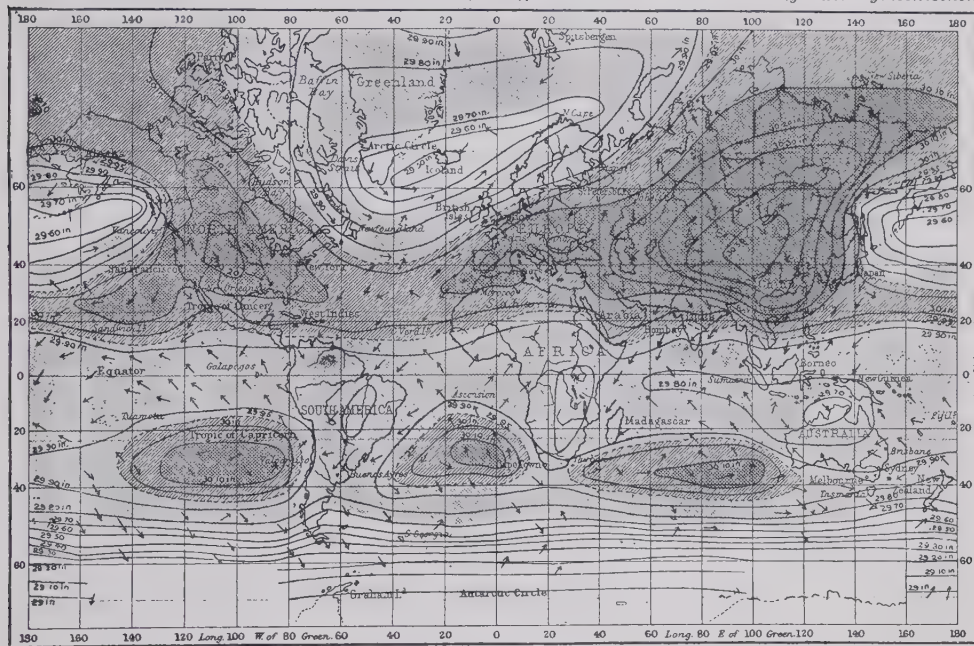
Wiltén, Austria. See INNSBRUCK.

Winchester, munic. and parl. bor. and city, Hants, 12 m. N.E. of Southampton, on the Itchen. It is a place of great antiquity, the *Caer Gwent* of the Britons and the *Venta Belgarum* of the Romans. A residence of the Saxon kings from the time of King Ælfric, it became the capital of the country, a distinction which it long enjoyed. A castle, built soon after the conquest, was later enlarged, especially in the reign of Henry III., whose birthplace it was; and from this period dates the present style of the great hall, the only portion remaining, now used as the county hall, and containing 'King Arthur's round table.' The city was formerly surrounded

by the ancient bishop's palace, with keep. Hyde Abbey (a ruined gateway only existing) was the burial-place of King Alfred and other Saxon princes. There are several ancient churches and a 15th-century cross. The hospital of St. Cross, founded about 1132, is richly endowed, and has a handsome Norman church. Winchester College, founded in 1387 by William of Wykeham, comprises extensive buildings surrounding two quadrangles, with cloisters forming a third, connected with the main buildings by an ambulatory. Pop. (1901) munic. bor. 20,929; parl. bor. 19,001. See *Kitchin's Winchester* (Historic Towns Series, 1891), Portal's *The*

Miscellany Poems, written by a Lady, appeared in 1713. Among her poetical experiments is a tragedy entitled *Aristomenes, or the Royal Shepherd*. In the preface to his poems of 1815 Wordsworth notices the appreciation of natural beauty in Lady Winchelsea's vigorous and suggestive *Nocturnal Reverie*.

Winckelmann, JOHANN JOACHIM (1717-68), German art critic, was born at Stendal in Prussia. He was appointed librarian to Count von Bünau in 1748. This brought him into touch with the art galleries of Dresden, which inspired him to write his first work, *Gedanken über die Nachahmung der griechischen*



Wind: FIG. 1—January Isobars.

by walls, of which two gateways remain—King's gate and West gate. The chief object of interest is the cathedral, dedicated originally to St. Swithun, and founded by Bishop Walkelin in the 11th century, the transepts, crypt, and part of the nave being of that date. It is the largest cathedral in England (560 ft. in length), and has a magnificent interior of various periods of architecture. Among many ancient monuments and memorials of Saxon and Danish kings and Norman princes are those of Hardicanute and William Rufus. The episcopal palace, now the church house, dates from the 17th century, and near it are the ruins of Wolvesey Castle (12th cen-

Great Hall, Winchester Castle (1899), and Milner's *History of Winchester*.

Winchester, city, Virginia, U.S.A., in the Shenandoah valley, 65 m. W.N.W. of Washington. Here, in September 1864, the Northern forces under Sheridan defeated the Confederates under Early. Pop. (1901) 5,161.

Winchilsea, ANNE, COUNTESS OF (d. 1720), English poetess, wife of Heneage Finch, fourth Earl of Winchilsea, was the friend of Pope and other men of letters, and contributed *Spleen*, her chief poem, to Gildon's *New Miscellany of Original Poems* (1701). *The Prodigy*, a poem which appeared in 1706, drew warm commendation from Cibber.

Werke in der Malerei und Bildhauerkunst (1754). In the following year his long-cherished desire to visit Italy was fulfilled, after his conversion to Roman Catholicism; and in 1760 he was appointed librarian to Cardinal Albani in Rome. Here he published *Anmerkungen über die Baukunst der Alten* (1762). This was only a prelude to his epoch-making work, *Geschichte der Kunst des Altertums* (1764). This book first revealed the great ideal character of Greek art, and exercised enormous influence on Goethe, Lessing, Wieland, and Schiller. Of equal importance for the history of art was his *Monumenti Antichi Inediti* (1767-8). Accuracy of detail, enthusiasm

and insight, a graceful prose style, and, above all, the power of inspiring others, are Winkelmann's great merits. He was assassinated at Trieste when returning to Italy with some gold coins in his possession. His *Gesammelte Schriften* were published in 12 vols. (1825-9). His *Gedanken* were translated by H. Fussli (1765), and his *Geschichte* by G. H. Ledge (1881, 2 vols.). An excellent biography is by K. Justi (1866 and 1872, 2 vols.). See further Goethe's *Winkelmann und sein Jahrhundert* (1805), A. Baier's *Winkelmanns Lehre vom Schönen* (1862), and Walter Pater's *Renaissance* (1873).

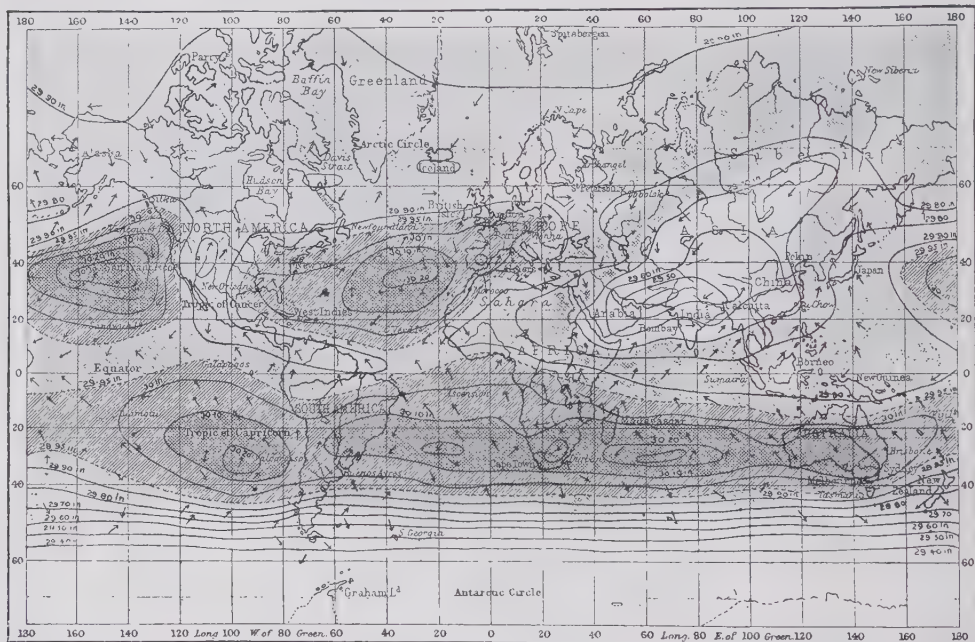
Wind is air in motion, and is

Force.	Description.	Velocity : Miles per hour.
0	Calm	3
1	Light air	8
2	Light breeze	13
3	Gentle	18
4	Moderate	23
5	Fresh	28
6	Strong	34
7	Moderate gale	40
8	Fresh	48
9	Strong	55
10	Whole	65
11	Storm	75
12	Hurricane	90

The relation between wind direction and barometric pressure is clearly seen on looking at an isobaric chart. (See Figs. 1, 2.)

periodical, and prevailing; but the whole problem of wind discussion, in spite of the monumental researches of Coffin, Buchan, Ferrel, and other workers, is far from being completed. See Coffin's *The Winds of the Globe* (1876), Buchan's *Report on Atmospheric Circulation* (1889), Ferrel's *A Popular Treatise on the Winds* (1893), Pomortzeff's *The Law of Distribution of the Velocity of Winds* (1894), *The Beaufort Scale of Wind-Force* (1906), Bartholomew's *Atlas of Meteorology*, and Bartholomew's *Physical Atlas* (vol. iii. 1899).

Windau, seapt. and seaside resort, prov. Courland, Russia, on l. bk. of Windau, 110 m. W.N.W.



Wind: FIG. 2—July Isobars.

directly produced by differences of pressure, there being a flow of the air from a region of higher to one of lower pressure, or from where there is a surplus to where there is a deficiency of air. Differences of atmospheric pressure arise from changes produced in the main by differences of temperature, which are, therefore, the ultimate cause of wind. The force and direction of the wind are registered automatically by means of an anemometer. The Beaufort scale is a notation whereby the relation between the force of the wind and the amount of sail that a ship could carry is given effect to. It was devised in 1805 by Sir F. Beaufort. In its modified form it is as follows:—

In anticyclones, or areas of high pressure, the wind blows outwards towards places where lower pressures prevail. Round these low-pressure areas the wind blows spirally inwards towards where the barometer is lowest. Owing to the deflecting force exerted by the rotation of the globe on its axis, the winds are turned to the right hand in the northern and to the left hand in the southern hemisphere. This force is inversely proportionate to the velocity of the earth's rotation, and increases from zero at the equator to a maximum at either pole. The strength of the wind is greatest in both hemispheres during the winter months. Winds have been classified into constant,

of Riga; exports timber, and has a castle (1290). Pop. (1897) 7,132.

Windermere, lake, Cumberland, and the largest in England, stretching 10½ m. N. and S.; greatest breadth, 1,610 yds. The shores are much indented and generally low, but steeper and more rugged in the S. In the centre are several wooded islets. It is drained by the Leven to Morecambe Bay. Alt. 130 ft.; maximum depth, 219 ft. See H. R. Mills's *Bathymetrical Survey of the English Lakes* (1895).

Windfalls, in law, are timber trees (not fruit trees) blown down by the wind. Sound trees so blown down belong to the landlord, while dotards, or dead timber, belong to the tenant. If

windfalls remain attached to the soil they are real property, otherwise they are personal property.

Wind-flower. See ANEMONE.
Windham, WILLIAM (1750-1810), English statesman, was born in London. In 1784 he entered Parliament as member for Norwich, and acted with the opposition. He was one of those charged with the impeachment of Warren Hastings. He was largely guided by Burke, and took alarm at the French revolution. In 1794 he took office under Pitt, and eventually became the secretary of war, holding office till 1801. In opposition to the Addington ministry he disapproved of the peace of 1802, and refused to join Pitt's administration in 1802; but later he joined Lord Grenville's administration, and with it resigned in 1807. See his *Diary*, ed. by Mrs. H. Baring (1866); and *Life*, by Amyot (1806).

Windhoek, GREAT, tn., cap. of German S.W. Africa, on the Swakop R., 170 m. inland from Walfish Bay. It possesses hot springs. Vines, peaches, oranges, figs, dates, and pomegranates thrive. Pop. (1902) 1,106 (whites).

Winding-up. See BUILDING SOCIETY, and COMPANY.

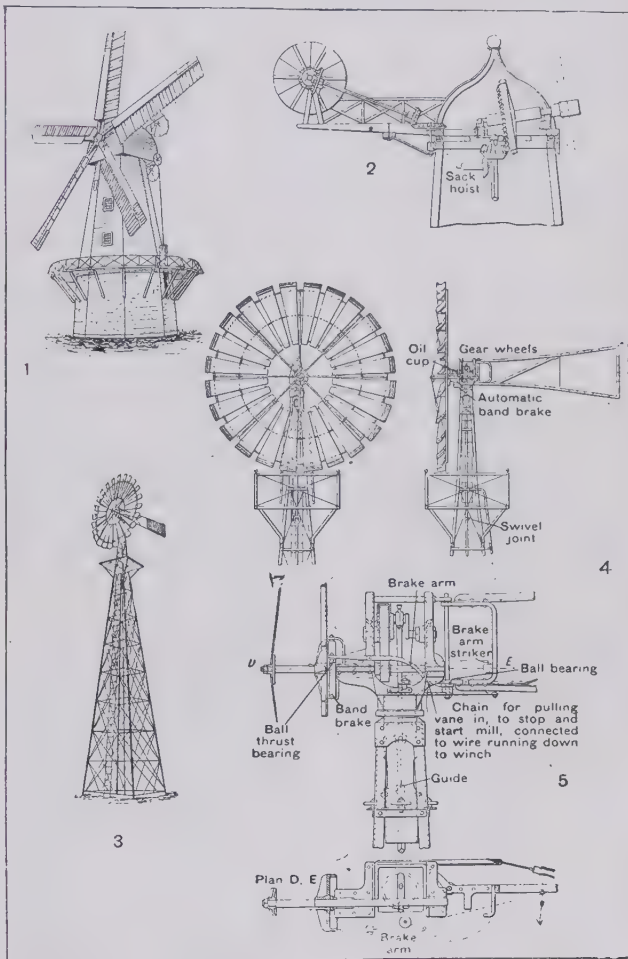
Wind Instruments are generally understood to include only those musical instruments which are sounded by the breath or by the combined action of the breath and lips of the performer. Orchestral wind instruments are of two classes: *viz.* wood winds—flutes, clarinets, oboes, and bassoons; and brass winds—horns, trumpets, and trombones.

Windischgrätz, PRINCE ALFRED ZU (1787-1862), Austrian field-marshal, born at Brussels; served in the campaign of 1814, and became field-marshal (1833). He defeated the insurgents in the revolution of 1848, taking Vienna by storm. He then led a large army into Hungary, but was removed from command owing to his dilatory conduct. See *Der k. k. österreichische Feldmarschall Fürst Windischgrätz* (1885).

Windmills are believed to have been first introduced into Europe in the 8th or 9th century. Figs. 1 and 2 are taken from *Traction and Transmission*, vol. vii. The principle of action in the windmill is very similar to that in the water turbine. The wind acts upon four or more sails or sweeps radiating from a shaft and set at an angle with the wind's direction. The plane in which the sails rotate is practically at right angles to the direction in which the wind is blowing. As the direction of the wind is somewhat variable, provision is made for bringing the sails to face the wind. This necessity originally led to

windmills being divided into the two following types:—The Post or German type, in which the whole body of the mill was supported upon a vertical post or pivot, upon which it could be revolved; and the Tower or Dutch mill, in which only the head, or dome, of the building was movable—the lower part, or

windmill or 'fan-tail,' the invention of Andrew Meikle. This consisted of a set of small sails placed in an upright position upon a long arm or frame projecting beyond the dome on the opposite side to the main sails, and revolving in a plane almost at right angles to the plane of revolution of the sails of the



Structure of Windmills.

(For explanation, see text.)

tower, being built of stone, brick, or timber. The dome was rotated through a toothed wheel, which geared with a circular rack on the outside of the upper part of the tower, and the turning was effected by manual labour in the older mills, and automatically in the more modern mills, which were provided with an auxiliary

windmill proper. (Fig. 1.) The axis of the wind shaft is usually inclined at an angle of from 8° to 15° with the horizontal, so that the main sails may clear the lower part of the tower, and in addition be in a more advantageous position to receive the impulse of the wind. A section through the dome of a tower mill is given in

Fig. 2, which shows the method of rotating the dome by means of the fan-tail, also the gearing connecting the wind shaft with the main vertical shaft. The length of each sail or sweep in an old type windmill was usually from 20 ft. to 40 ft. The angle which the surface of the sail makes with its plane of revolution is called its 'weather.' The weather of the sail usually varies from 7° at the extremity to 18° at the end nearest the wind-shaft.

Provision is made for adjusting the amount of sail area to the strength of the wind, generally by 'reefing' the sails. Another method was to make the sails of a series of flaps, shutters, or louvers, made of light deal, or of canvas stretched on wooden frames. Each shutter was pivoted so as to admit of being rotated about an axis at right angles to the whip.

During the past few years there has been a great development in the manufacture of small power wind-pumping engines, especially in America. Instead of four to six sails of large width, as in the old type of windmills, there are a considerable number of thin sheet-steel sails or blades arranged radially round a shaft, and forming a wheel. Control is effected by mounting the wheel on a revolving head and providing a rudder or tail-vane, which, with any change of the wind, will allow the wheel to run into the wind, or in the case of excessive velocity throw the wheel more or less out of the wind. The sails are usually slightly concave on the windward side, and are set at an angle such that their tips move about 2½ times the velocity of the wind. The wind shaft may be horizontal or inclined, and generally runs in roller or ball bearings. The pump is driven either direct off the wheel shaft or through suitable bearing. The wheel is mounted on the top of a tower usually built of steel angles suitably braced. Fig. 3 is an illustration of a typical wind-pumping engine, erected on a steel tower; Fig. 4 is a front and side elevation of the wheel, tail-vane, etc.; and Fig. 5 is an elevation and plan of the head gearing. In the particular windmill here illustrated the wheel is 16 ft. in diameter, with twenty-four blades, each blade being 5 ft. 3 in. long, tapering from 20 in. to 8 in., and curved to a radius of 20 in. The wheel spindle drives the pump crank shaft through $2\frac{1}{2}$ to 1 in. spur gearing. On the boss of the wheel there is a steel band brake (see Fig. 5), operated by an arm pressed by a pin or striker fixed on the arm of the tail-vane. It automatically comes

into action when the mill is at work in gusty weather, and also when the wheel is pulled out of action by a windlass fitted at the base of the tower. The wheel-shaft is set a little to one side of the centre (see front elevation Fig. 4, and plan Fig. 5), and the tail-vane directly in the centre; thus, when working in strong winds, the wheel is inclined to turn out of the wind, but is controlled by coiled springs connecting the tail-vane with the head of the machine, which keeps the machine sufficiently in the wind to allow of its working at a proper speed for pumping. The revolving head is supported on ball bearings at the cap of the tower; any lateral pressure is taken up by a steel tube which descends through the tower head, and is guided by four rollers. See Wolff's *The Windmill as a Prime Mover* (new ed. 1900).

Window-gardening, the growing of plants in pots within the window of a room, or in pots or boxes on the window-sill outside. The plants that may be satisfactorily grown in windows include zonal pelargoniums, scented-leaved geraniums, dwarf campanulas, primulas of all sorts, aubrietia, wallflowers, anemones, narcissi, tulips, irises, forget-me-nots, daisies, petunias, musk, and asters. Then there are fragrant herbs such as southernwood and thyme, and herbs and salad plants such as parsley and cress. Ferns, too, of many kinds do well in pots or window-boxes. Agaves, gasterias, sempervivums, echeverias, echinocactus, and mammillarias are especially suitable for indoor decoration all the year round. *Isolepis gracilis* and the blue-leaved *Festuca glauca* are both worth growing in the window during winter.

Windows. The earliest example of windows playing any important part in architectural construction are the clerestory lights in the great temples and palaces of Egypt, as at Karnak and Thebes, and in the Assyrian and Persian palaces, where large roof windows were formed with timber not unlike modern deck lights, as at Korsabad and Persepolis; these, of course, were open to the elements. Much discussion has taken place on the question of the lighting of Grecian and Roman temples. Ferguson ingeniously fits in clerestory windows after the Egyptian method to several Greek temples in a more or less conjectural manner. There is little doubt, however, that some of these temples had openings in the roof, while it is suggested that some were lighted by openings in the ceiling only, the roof above being of thin marble slabs which allowed a diffused light to pene-

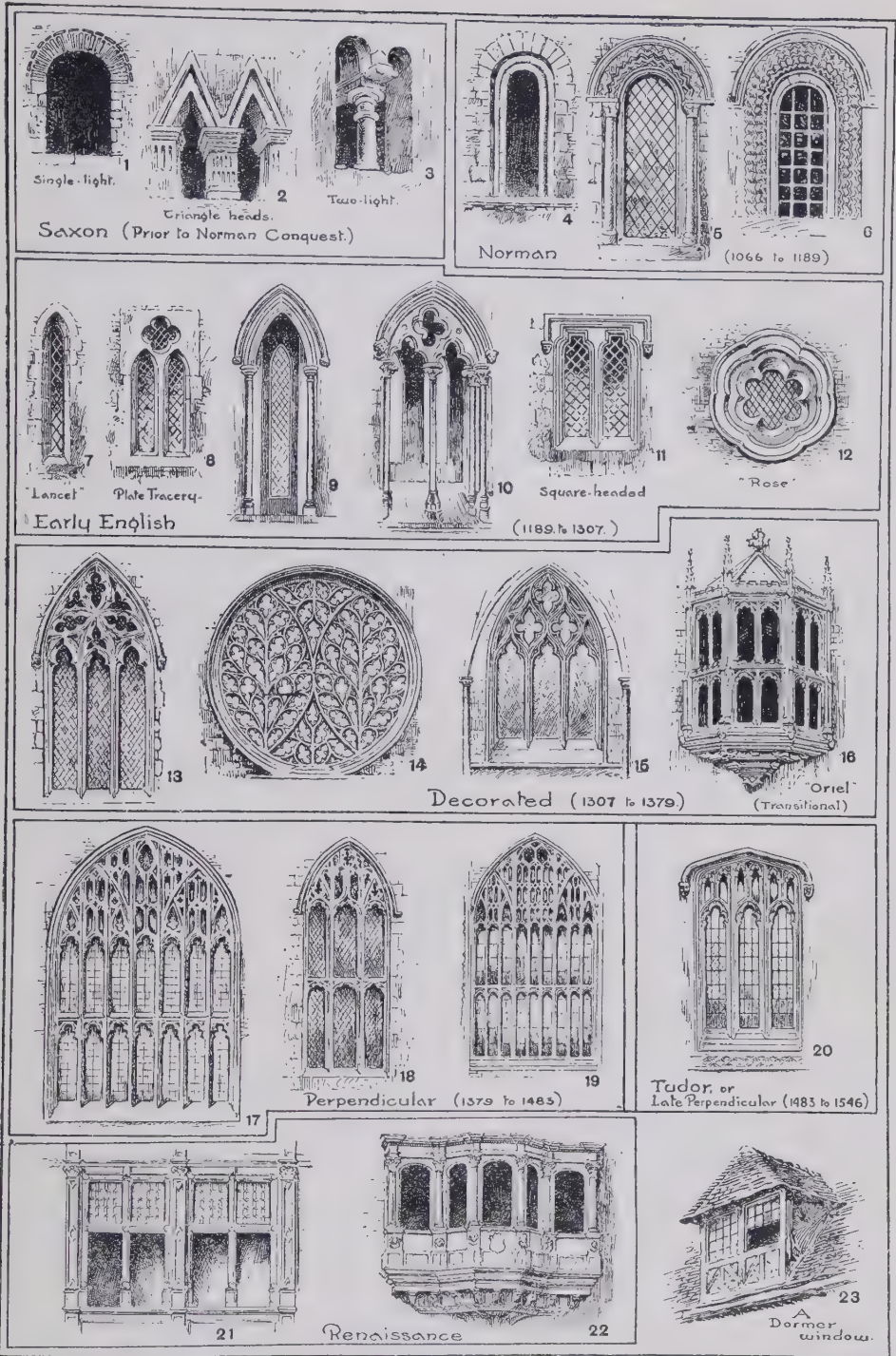
trate the *cella*. The Erechtheum on the Acropolis has windows in the west wall, and the great temple at Agrigentum in Sicily had windows in the walls of the side aisles. In Roman houses the *atrium*, or principal hall, was open to the roof, while the rooms entering off the same were lighted only by the doors. Later they had windows protected by shutters, and a transparent material, probably mica, was used for glazing, till in the 2nd century horn came into general use. In the middle ages cloth seems to have been used, as with the Chinese today.

The first use of glass in windows is variously stated; but there is no doubt that the introduction of stained glass into church windows gave a new and overpowering impetus to Gothic architecture, and eventually made the whole idea of construction subservient to its display. Windows are sometimes built up as separate architectural features in the roof. These are called dormer windows, from the fact that dormitories in old monasteries were often in the roof. Such windows are common in French Renaissance buildings. When a window projects from the face of the wall and is supported on corbels, it is called an oriel window; these were common in English houses of the 15th century. Lattice windows are frames divided into small panes with astragals or lozenges; French or casement windows open like doors; while modern windows are called sash-and-case windows—the sash being the frame for the glass, and the case being the fixed frame casted for the counterbalance weights.

Windpipe. See TRACHEA.

Wind River, range of mountains in W. Wyoming, U.S.A., a part of the Rocky Mountain system, separating the sources of Green and Snake Rs. from those of Wind R., which is tributary to the Yellowstone. Many of the peaks exceed 13,000 ft. in height, and are extremely rugged, having been extensively glaciated in recent times. Among these are Mt. Chauvenet (13,000 ft.) and Fremont Peak (13,790 ft.).

Windsor. (1.) Parliamentary and munic. bor. and mrkt. tn., Berkshire, England, on the Thames, 22 m. w. of London. The present town replaced an older one, now represented by the village of Old Windsor, about 2 m. to the E., where was a royal residence granted with the town by Edward the Confessor to the monks of Westminster. William the Conqueror regained possession of it, and occasionally resided there. He built a fortress on the hill now occupied by the castle, and around this grew up the new



Types of Windows.

Anglo-Saxon.—1. Brixworth, Northants. 2. Deerhurst, Gloucester. 3. Wrexham, Denbigh. **Norman.**—4. Cassington, Oxon. 5. Devizes, Wilt. (c. 1160). 6. Ilfley, Oxon. **Gothic.**—7. Burwash, Sussex. 8. Lillington, Warwickshire. 9. Bakewell, Derbyshire. 10. Stone, Kent. 11. Claphorne, Northants. 12. Strixton, Northants (c. 1250). 13. Eling, Hants (c. 1320). 14. Lincoln Cathedral (c. 1350). 15. Wells Cathedral. 16. Thornton Abbey, Lincolnshire (c. 1370). 17. St. Mary's, Oxford. 18. Headcorn, Kent. 19. Norwich Cathedral. 20. Yelvertoft, Northants. **Renaissance.**—21. Orleans. 22. Colmar.

town. The parish church, a handsome edifice, replacing one pulled down in 1820, contains many ancient monuments; and there is a spacious military church (Holy Trinity), of which the foundation stone was laid by Prince Albert in 1842. Other public buildings are the Guildhall and the Masonic Hall, both designed by Sir Christopher Wren; the Albert Institute, and a statue of Queen Victoria. There are also military barracks. A bridge 200 ft. long connects the town with Eton, and two other bridges cross the river to Datchet. At Clewer, 1 m. to the W., is a large group of charitable institutions (penitentiary, hospital, orphanage, convalescent home), under the care of an Anglican sisterhood. Windsor returns one member to the House of Commons. Parliamentary bor. (partly in Bucks)—area, 3,275 ac.; pop. (1901) 21,480; munic. bor.—area, 2,527 ac.; pop. (1901) 14,130. (2.) Town, Essex co., Ontario, Canada, on the Detroit R., immediately opposite the city of Detroit. It is chiefly a residential town, largely for Detroit people. Pop. (1901) 12,153. (3.) Seaport town, Nova Scotia, on Minas Basin, off the Bay of Fundy; is the seat of King's College (founded 1787), an Anglican institution. The town was visited by a disastrous fire in 1393. Pop. (1901) 3,393.

Windsor Castle, the chief royal palace of England, stands on an eminence near the Thames, in the E. of Berkshire. The buildings and immediate grounds cover an area of 12 ac. Henry I. made extensive additions to the fortress constructed by William the Conqueror, and the fortress became a palace. Henry III. strengthened its fortifications. Edward III. was born here, and after his accession he rebuilt and greatly enlarged the palace, erected the keep, the Winchester Tower, Chapel of St. George, and St. George's Hall; and here he held the first installation of knights of the Order of the Garter. Tudor and Stuart sovereigns contributed their quota of additions and improvements, and James II. and William of Orange added fine collections of paintings. During the reigns of George III. and George IV. more than a million pounds of public money was spent on the castle under the direction of Jeffrey Wyatt, afterwards Sir Jeffrey Wyatville. The works included the erection of new towers, handsome entrances, addition of a story to the general elevation, and the rearrangement of the pleasure grounds and parks. The new stables were built in the early part of Queen Victoria's reign. The castle comprises three principal

divisions—the Upper, Middle, and Lower Wards. The first has a large quadrangle, the chief entrance to which, opposite the Long Walk, is flanked 'by' the battlemented towers of York and Lancaster. On the E. side of the quadrangle are the private apartments of the sovereigns, on the S. the Visitors', and on the W. the State Apartments. The last include the Audience, Presence, Grand, and Waterloo Chambers, St. George's Hall, Grand Reception Room, Grand Vestibule, State Anteroom, and the Zuccarelli and Vandyke Rooms, with splendid collections of the works of these painters. A corridor, 520 ft. long and richly decorated, runs along the S. and E. side. On the W. side of the quadrangle is the Round Tower or Keep, forming the Middle Ward. It formerly served as the residence of the constable, and also as a state prison. The lower part is surrounded by a rampart mounted with cannon. West of the Round Tower is the Lower Ward, approached from the town by Henry VIII. gateway, and comprising St. George's Chapel, Albert Chapel, Deanery, and canons' houses, cloisters, Lord Chamberlain's Office, and houses of the military knights. St. George's Chapel, built chiefly by Edward IV., was greatly enriched by Henry VII., and still more by George III. It is a cruciform edifice, with nave of seven bays and eight side chapels and two chantries. In the choir are the stalls of the sovereign and of the Knights Companions of the Order of the Garter, and beneath the choir the royal vault. Opposite the east end of the choir is the royal tomb house, formerly known as the Wolsey Chapel, but now as the Albert Memorial Chapel, containing a magnificent cenotaph with recumbent figure of the Prince Consort. A terrace, 2,900 ft. in length, surrounds the castle on the N., E., and S. sides; below, on the E., is the sunk garden, opposite the private apartments; and on the N. are the ornamental pleasure-grounds, known as the 'slopes.' The royal stables occupy an outlying block near the Long Walk, and include a riding-school (200 ft. in length). The Home Park, immediately adjacent to the castle on the N.E. and S., has an area of 500 ac. The Great Park, of about 1,800 ac., is traversed for three miles by a magnificent avenue known as the Long Walk, terminated by Snow Hill, an eminence surmounted by a statue of George III., and having by the side of it the royal palace and mausoleum of Frogmore, in the latter of which rest (since 1862) the remains of the Prince Consort and Queen Victoria. Vir-

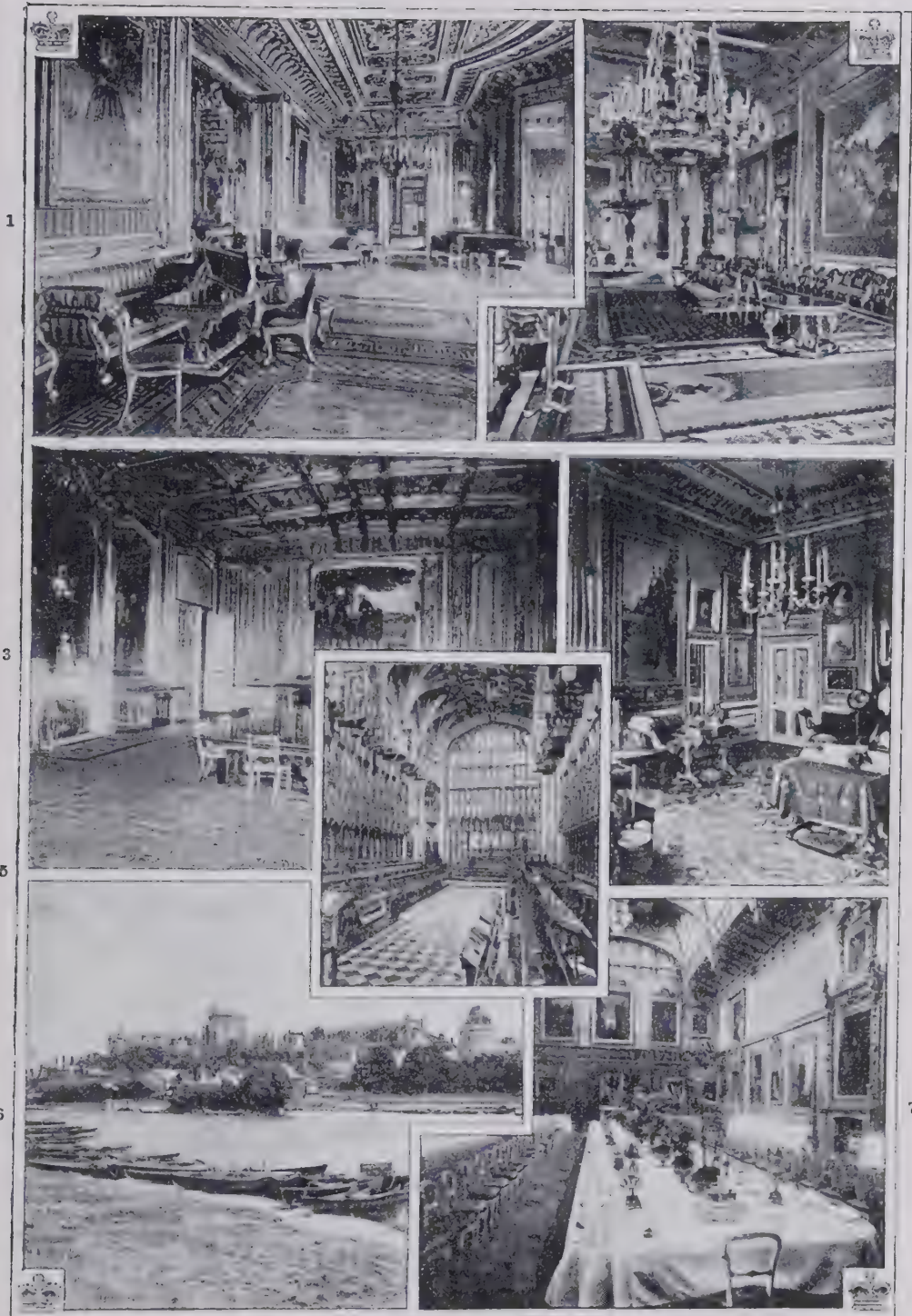
ginia Water, a large ornamental lake, lies in the south of the park.

Windthorst, LUDWIG (1812–91), German statesman, born near Osnabrück in Hanover. A devout Roman Catholic, he was appointed president of the Catholic consistorium and one of the judges (1848) of the Hanoverian Supreme Court of Appeal. He then became a representative for his native place in the Hanoverian Second Chamber. Elected president of the Chamber (1851), he became in the same year minister of justice. After the annexation of Hanover by Prussia he became a member both of the Prussian Parliament and of the North German Diet, and ere long was recognized as the leader of the Ultramontane Opposition against Bismarck. His skill in debate, his tactical resourcefulness, and his infinite patience enabled him again and again to defeat the great chancellor's schemes. 'See *Life*, in German, by Manzenbach (1891–2), and by Knopp (1898).

Windward Islands. See WEST INDIES.

Wine, an alcoholic beverage produced by the fermentation of sugars expressed from many sweet fruits, such as grapes, currants, raspberries, elderberries, apples; or from vegetables, as rhubarb and carrots; or even from flowers, as the cowslip. All the more important wines are obtained from grape juice alone. Noah was well acquainted with the fermented juice of the grape. The Jews, Assyrians, Greeks, Egyptians, Romans, all had their favourite wines. Many of the famous modern wines are obtained from vineyards situated on southerly or westerly mountain slopes and river banks. Modes of propagation and special varieties of vines; improvements in the machinery for expressing the juice; treatment of the 'must' or expressed juice during fermentation; types of yeast best adapted for aid in producing the special bouquet and other characteristics; improvements in finishing and maturing, and not the least in combating the ravages of the phylloxera, insect pest, mildews, and other disease-producing micro-organisms both on the plant and the wine—all these matters have been carefully studied.

The ripe fruit contains numerous constituents, all of which vary considerably with the soil, climate, position of the vineyard, and variety of grape. As a general rule, when the grapes are just fully ripe they yield the best wine as regards strength and flavour. Some varieties require to be gathered just before the fruit is ripe; others, especi-



Views at Windsor Castle.

1. Crimson dining room. 2. Grand reception-room. 3. State dining-room. 4. Queen's private sitting-room. 5. St. George's Chapel. 6. The Castle from the river. 7. Waterloo room, arranged for a banquet. (Photos 1, 2, 3, 4, 6, and 7 by H. N. King; 5, by Frith.)

ally the muscatels, when somewhat overripe, in order to give the characteristic bouquet of the wine. Tokay wines are made from grapes which have been partially dried on the vines. Grapes containing much sugar, which may be due to either a variety of vine or to a rather dry warm summer, yield generous alcoholic wines, and these when dry—i.e. when they contain but little unfermented sugar—are often very full-bodied. When deficient in sugar, it may be necessary to add sugar, or concentrate the 'must' by boiling down, or spread the grapes in the sun to dry partially, or some other device must be adopted.

The fermentation of the 'must' is said to be a spontaneous act, but it is due to wine yeasts which exist in the bloom on the berries. During recent years Hansen of Copenhagen, Jacquemin of Paris, and others, have obtained pure cultures from the more important vineyards; consequently each producer is able to use the particular type which gives the chief characteristics of his wine. In rather less than a month the primary fermentation is over, and the turbid liquid has become moderately clear. The new wine is run off from the precipitate of argol and lees into other casks, in which an after-fermentation proceeds for some months. It is finally transferred to the finishing casks, where the fining with isinglass to clarify, sulphuring to prevent corkiness and other diseases due to micro-organisms, colouring and doctoring when necessary, and plastering, are carried out. This last is of some importance, as natural or unfortified wines have a tendency to become turbid with both increase of age and temperature. Gypsum or other form of calcium sulphate is added, which precipitates salts of the various acids out of the wine, and so increases its stability. The residue of wines left in the fermentation vats is known as lees, and is an important source of cream of tartar and ordinary tartaric acid. The residue from the wine press is known as marc, a substance frequently worked up into inferior grades of brandy.

Wines are distinguished by their colour, flavour, bouquet or aroma, taste on the palate, and as still or sparkling. These points of difference depend on the variety of grape vine, the soil and site of the vineyard, the treatment of the fruit at the time of vintage, and the difference in the mode of manufacture and finishing. Thus, if fermentation is stopped before all the sugars have been decomposed, a fruity wine is the result. Dry wines are due to the

completion of the fermentation of the sugars. Effervescing or sparkling wines are caused by the presence of carbon dioxide, by bottling the fermenting liquid and allowing the fermentation to finish in the bottle. The chief characteristic of a wine is the quantity of alcohol present. When the whole of the alcohol has been produced by fermentation, and this rarely exceeds 14 or 15 per cent. by volume, the wine is said to be a natural one. All others containing above this limit are spoken of as fortified or brandied wines. Light wines—as burgundy, clarets, hocks—contain from 7 to 12 per cent. of alcohol; while the strong, fortified ones range from 16 to 35 per cent. Unfortunately there is no standard by which the characteristics of a wine—say quality, flavour, bouquet, body—may be judged after it has matured. The after-treatment affects it enormously—for instance, the length of time required to mature (and this depends partly on the vintage season), the quantity of spirit added, the colouring matters used, the artificial flavouring employed. The natural colours of wines are due to, in the case of red wine, leaving the skins in the vats during primary fermentation. The pale to golden tints are partly caused by oxidation of tannins and similar bodies. 'Must' is a complex mixture of bodies in solution. The bouquet of a wine is due to the ethers, and probably also to the yeast action. The peculiar vinous odour and taste are caused by traces of cænanthic ether, and when the wine is distilled this volatile ester passes over into and characterizes the brandy produced. Fixed esters are predominant in fortified wines, while volatile ones are predominant in natural wines, especially those that are poor in alcohol and sugar.

The more important modern wines are champagne, claret, burgundy, port, sherry, hock, madeira, marsala. Burgundy is a dark-red natural wine, produced in the eastern centre of France, California, and Australia. Champagne is the sparkling product of Champagne, Loire, Marne, and the Jura in France; Australia, New Zealand, and the Cape. Claret is the light-red wine of Médoc and the district around Bordeaux, and Karlowitz in Hungary. Hermitage is a class of wine for which the Rhone valley is famous. Hock and moselle are light sparkling wines, the production of the vineyards bordering on the Rhine, Moselle, and Main. Madeira is a sherry type of fortified wine,

containing a high percentage of volatile esters. Marsala is a Sicilian wine, also of the sherry type. Malaga is a sweet, luscious wine of the south-east of Spain. Port is a strongly-fortified red wine, produced in Portugal, France, north of Spain, the Cape, and Australia. Sauterne is the white wine of the Graves district of France. Sherry is a strongly-fortified golden wine, for which the Heves district of Spain has long been famous. It is also obtained from the Canary Isles and elsewhere. Tokay is the finest of Hungarian wines. See Batillat's *Traité sur les Vins de la France* (1846); Dupré's *Analyse des Matières Alimentaires*; Hutchison's *Food and Dietetics* (1900); Monavon's *La Coloration Artificielle des Vins* (1890); Neubauer's *Ueber die Chemie des Weines* (1870); Pasteur's *Etude sur les Vins* (1866); Schmidt's *Die Weine des Cabineckeller* (1898); Thudichum's *A Treatise on the Origin, Nature, and Varieties of Wine* (1894).

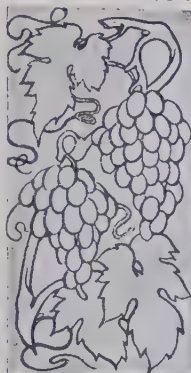
Winfield, city, Kansas, U.S.A., co. seat of Cowley co., 47 m. S.S.E. of Wichita. Pop. (1900) 5,554.

Winfried. See BONIFACE, ST. **Wing**, in engineering, a term signifying a projection: wing walls are the retaining walls at the ends of a bridge.



Sir Francis Reginald Wingate.
(Photo by Elliott & Fry.)

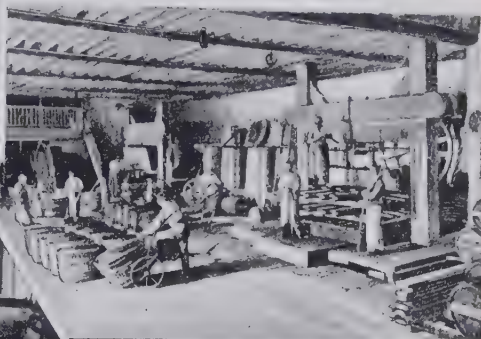
Wingate, SIR FRANCIS REGINALD (1861), British general, born at Broadfield in Renfrewshire. Practically the whole of his career has been spent in Egypt and the Sudan. He served through the Nile expedition of 1884-5. In the operations on the Sudan frontier in 1889 he was present at Toski. He took part in the further operations in 1891, including the capture of Tokar. He was director of military in-



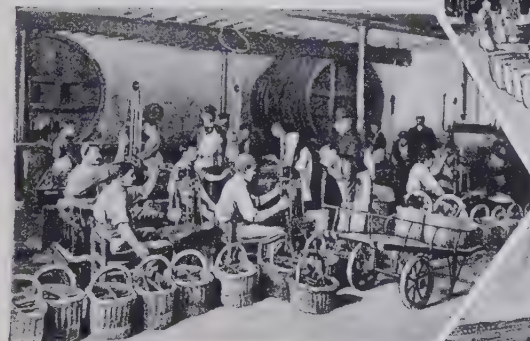
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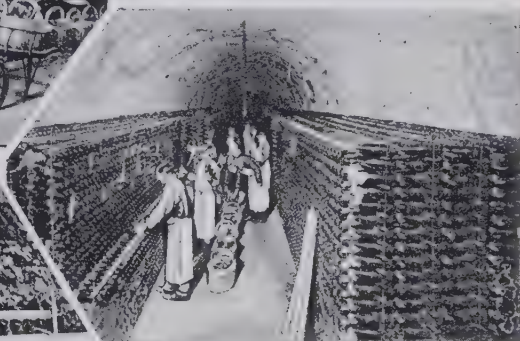
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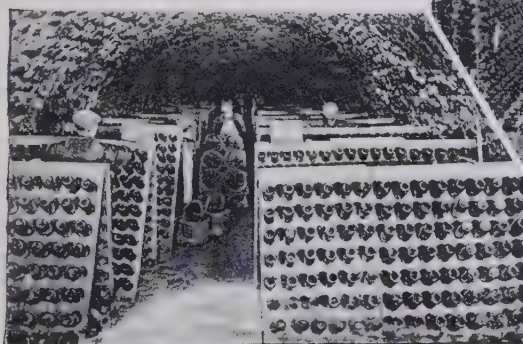
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Wine Manufacture.

1. Picking in an Australian vineyard (Mt. Ophir, Victoria).
2. Fermenting tanks (Mt. Ophir).
3. Wine press in a champagne district.
4. Bottling and corking.
5. Storing champagne.
6. Champagne fermenting in bottles.

telligence with the Dongola expeditionary force in 1896, and was present in the engagements at Firket and Hafir; and, again in the same capacity, in the operations in 1897-8, which resulted in the capture of Abu Hamed and the subsequent occupation of Berber; and in the final phase of the reconquest of the Sudan in 1898, when he took part in the battles of Atbara and Omdurman (September). Wingate came up with the fugitive Mahdi on November 24, near Gedid, and annihilated his force, the Mahdi himself being among the slain. In December 1899 Sir Francis Wingate became Sirdar of the

rushed forward, grasped as many of the Austrian spears as he could, and bore them to the ground by sheer weight, thus making a path for his comrades over his pierced body.

Winkler, CLEMENS ALEXANDER (1838-1904), German chemist, was born at Freiberg, and became professor of the Mining Academy there in 1873. His chief work consisted in developing the methods of gas analysis, in advancing mineralogical chemistry, and particularly in discovering the element germanium, which proved to be the eka-silicon predicted by Mendeléeff. He wrote *Anleitung zur chemischen Unter-*

a large trade by river as well as by rail. Here is the University of Manitoba. Pop. (1881) 6,000, (1906) 90,216.

Winnipeg Lake, in Manitoba and Keewatin, Canada, N. of Winnipeg, covers an area of 8,555 sq. m. It receives the Winnipeg in the E., the Assiniboine and the Red R. in the S., the Saskatchewan in the W., and is drained by the Nelson into Hudson Bay.

Winona, city, Minnesota, U.S.A., co. seat of Winona co., on the Mississippi, 100 m. S.E. of St. Paul. Pop. (1900) 19,714.

Winsey, or WINCEY, a mixed textile fabric, plain or twilled, generally with a cotton warp and



Main Street, Winnipeg.

(Photo by Notman, Montreal.)

Egyptian army, and was promoted major-general (1903). He is the author of *Mahdism and the Egyptian Sudan* (1889), and the translator of *Ten Years' Captivity in the Mahdi's Camp* (1891), by Joseph Ohrwalder, and of *Slatin Pasha's Fire and Sword in the Sudan* (1895).

Wings. See BIRDS AND FLIGHT.
Winkelried, ARNOLD VON, a knight of the Swiss canton of Unterwalden, one of the heroes in the struggle for Swiss independence. At the decisive battle of Sempach, near Lucerne (1386), the Austrians formed a dense mass of steel, which the utmost efforts of the Swiss failed to penetrate. At last Winkelried

suchung der Industriegas (1876-79) and *Die Massanalyse nach neuem titrimetrischen System* (1883).

Winnipeg, city, cap. of prov. Manitoba, Canada, is situated at confluence of Assiniboine and Red Rs., 40 m. S. of Lake Winnipeg, and 1,424 m. by rail W. of Montreal. In 1871 it had a population of 241, and was one of the Hudson's Bay Co.'s trading posts, known as Fort Garry. Since its choice as the capital of Manitoba its growth has been very rapid; and its trade has increased faster even than its population, for the opening of the Canadian Pacific Ry. across the continent made it an important distributing centre. It does

woollen filling. Though usually made of gray, drab, or brown colours, without any pattern, checks or stripes are introduced into fancy winseys. This fabric is made in Aberdeen, Perth, and other places.

Winslow, EDWARD (1595-1655), English colonial governor, was born at Droitwich, and having joined the English Puritan exiles at Leyden, in 1620 sailed with them for America. In 1623 he was selected as their agent in England, and while there he published *Good News from New England* (1624). In 1624 he was elected by the colonists assistant governor, to which office, or that of governor, he was annually re-

elected till 1646. He returned to England (1646) on a mission to defend the colonists, and was there active in a pamphlet warfare on their behalf. He found employment under the commonwealth, and did not return to the colony, dying on the expedition which resulted in the capture of Jamaica.

Winslow, FORBES BENIGNUS (1810-74), English physician, was born at Pentonville, London. He wrote *Physic and Physicians*, anecdotal (1839); *The Anatomy of Suicide* (1840); *The Plea of Insanity in Criminal Cases* (1843); and *The Incubation of Insanity* (1845). He gradually made a reputation as a specialist on insanity; founded the *Quarterly Journal of Psychological Medicine* (1848); and wrote *On the Obscure Diseases of the Brain and Mind* (1860), and *On Uncontrollable Drunkenness* (1865).

Winslow, JOHN (1702-74), American general, grandson of Edward Winslow, was born at Marshfield, Massachusetts, and was the principal actor in the tragedy of the expulsion of the Acadians from Nova Scotia (1755). He was commander-in-chief at Fort William Henry (1756), and afterwards became a judge in Plymouth county (1712), and member of the Massachusetts Legislature during the Stamp Act difficulties.

Winslow, LYTLETON STEWART FORBES (1844), English physician, founder of the British hospital for mental disorders in London; is a native of London. He is one of the leading specialists in mental diseases, and has given evidence as an expert in many of the principal criminal cases in Britain and America. His works include *Manual of Lunacy* (1874), *Handbook for Attendants on the Insane* (2nd ed. 1882), *Fasting and Feeding Psychologically Considered* (1881), *Aids to Psychological Medicine* (1882), *Youthful Eccentricity a Precursor of Crime* (1895), and *Mad Humanity* (1898).

Winsor, JUSTIN (1831-97), American historian, born in Boston, Massachusetts. In 1868 he was appointed librarian of the Boston public library, and in 1877 received a similar post at Harvard University, which he held until his death. He wrote *Christopher Columbus* (1891), *Cartier to Frontenac* (1894), *The Mississippi Basin* (1895), *The Westward Movement* (1897), *Was Shakespeare Shakespeare?* (1887), *Reader's Handbook of the American Revolution* (1879); and he edited *Memorial History of Boston* (4 vols. 1880-1), and *Narrative and Critical History of America* (8 vols. 1884-9).

Winstanley, HENRY (d. 1703), English engineer and engraver, was born probably at Saffron Walden, and became a clerk of

works on Charles II.'s estates. In 1696 he was asked to make designs for a lighthouse on the Eddystone Rock, and they were adopted. He superintended the construction, and was carried off a prisoner by a French privateer (1697). On regaining his liberty he returned to his labours, and the edifice was completed (1700). Winstanley was swept away with the entire structure, which was largely built of wood, in a great storm in 1703.

Winston, city, N. Carolina, U.S.A., co. seat of Forsyth co., 60 m. w. of Raleigh. Tobacco and cotton are the principal manufactures. Winston and Salem (pop. 3,642) are continuous towns. Pop. (1900) 10,008.

Wint, PETER DE (1784-1849), English water-colour painter, born at Stone in Staffordshire, of Dutch extraction. He entered the Royal Academy in 1807. In 1810 he became an associate of the Water Colour Society, and two years later a member. Among his works, some of which are in oils, are *Lincoln Cathedral*, *Haddon Hall*, *Hay Harvest*, and *The Cricketers*. See *Memoir*, by Armstrong (1888).

Winter, the coldest season of the year, defined astronomically as beginning, in the northern hemisphere, with the sun's entry into the sign of Capricorn, about December 21, and terminating at the vernal equinox. It thus extends from the shortest day, when the sun attains his greatest southern declination, to the moment of his crossing the equator at the ascending node of his apparent orbit. Winter in southern latitudes coincides with the northern summer.

Winter, JOHN STRANGE. See STANNARD, MRS. A.

Winter, WILLIAM (1836), American author and dramatic critic, born at Gloucester, Massachusetts; was appointed dramatic critic for the *New York Tribune* (1865). Since 1891 he has been president of the Staten Is. Academy. Among his many works are *Shakespeare's England* (1886), *The Wanderers* (1888), *The Trip to England* (2nd ed. 1880), *Edwin Booth* (new ed. 1878), *The Jeffersons* (1881), *Stage Life of Mary Anderson* (1886), *English Rambles* (1883), and *Henry Irving: Studies of His Acting* (1885).

Winter Berry, a name given to the black alder (*Ilex verticillata*), a N. American shrub, with pointed oval leaves, downy on the underside of the veins. It flowers in early summer.

Winter Cherry, a hardy herbaceous plant, belonging to the order Solanaceae. It is a native of China. It bears in summer white flowers with yellow anthers. These are followed by edible

scarlet berries, which persist for some months.

Winter Gardening is perhaps generally taken to refer to a sort of conservatory, in which are beds and borders of plants which would not succeed in the open air during the winter months. Tree ferns, palms, camellias, roses, araucarias, and rhododendrons are among the larger plants commonly grown. But even without glass, we may have our gardens bright with Christmas and Lenten roses or hellebores. A plant somewhat related to the hellebores is the pretty little winter aconite (*Eranthis hyemalis*). In warm, sheltered situations, two species of Scilla often produce their flowers in January—*Scilla bifolia*, and *S. siberica*, with flowers of intense blue. Some of the anemones often begin to flower in winter, especially the blue wind-flower of Greece (*A. blanda*), and in warm situations the old *A. coronaria* itself. Some of the species of crocus, also, belong to the winter bloomers—notably the mauve *C. imperati*, and the pale lilac *C. pulchellus*. In sheltered shady spots, the round-leaved cyclamen (*C. coum*) and its white-flowered variety (*C. hyemale*) produce a abundance of little flowers often quite early in January.

The common primrose and its garden varieties, as well as many other species of *Primula*, sometimes begin to show their flowers soon after Christmas. One of the very earliest is the purple Caucasian primrose (*P. amana*). But of all the flowers of winter the most beautiful is the fragrant *Iris reticulata*. Other fragrant species which bloom in winter or very early spring are the soft blue *Iris stylosa*, or which there is an equally beautiful white variety, and the purple and rose *Iris histrio*, somewhat resembling *Iris reticulata* in habit and colouring.

The flowers which usher out the winter include the single and double common snowdrops (*G. nivalis*), the handsome *Galanthus Elwesii*, the broad-leaved *G. latifolius*, and a fragrant hybrid derived from it, *G. Alleni*. Several of the periwinkles, notably the lilac *Vinca acutiloba*, bear flowers during December and January, and in warm sheltered spots violets and roses may often be picked in the open air. Among the shrubs, several of the most beautiful bear their flowers in the depth of winter—e.g. the winter sweet (*Chimonanthus fragrans*). The *Chimonanthus* is worth a place against a warm wall, facing south. The variety known as *C. grandiflora* bears somewhat larger flowers. The scarlet flowers of *Cydonia japonica* (the Japan quince) are familiar to every one. Other

species of quince, however, are equally well worth growing—*C. Maulei*, with orange-red flowers; *C. nivalis*, with large white flowers; and *C. cardinalis*.

When the climate is mild, and the soil not too heavy, the laurustinus (*Viburnum tinus*) is of great value in winter and early spring. The yellow jasmine and the shrubby honeysuckles (*Lonicera fragrantissima* and *L. Standishi*) are easy to grow. The old *Daphne mezereum*, single and double, the double furze (*Ulex europaeus flore pleno*), and the evergreen *Garrya elliptica*, with its harder variety *Thuretii*, should all be grown.

Among the plants which bear evergreen and evergray foliage may be named lavender, rosemary, pinks, carnations, mulleins, alyssum, lavender cotton, *Stachys chrysanthra*, *Achillea umbellata*, *A. moschata*, *Silene maritima*, *Hieracium villosum*, *H. gymnocephalus*, *Cistus* (of sorts), *Artemisia lanata*, *Senecio leucophyllus*, *Tewerum aureum*, *Cerastium tomentosum*, *Arabis variegata*, *Gysophylum repens*, *Festuca glauca*, *Sedum turkestanicum*, *Olearia insignis*, *Agrostis mma coronaria*, and *Onopordon arabicum*.

Wintergreen Oil, methyl salicylate, $C_6H_4(OH)COOCH_3$, is the essential oil of *Gaultheria procumbens*. It is an oily liquid (sp. gr. 1.97, b.p. 224° c.), with a pleasant smell, and is used for flavouring and for the preparation of natural salicylic acid.

Winter's Bark, the bark of an evergreen shrub, *Drimys Winteri*, belonging to the order Magnoliaceae. It is a native of S. America, and bears corymbs of white flowers. The bark has aromatic and tonic properties.

Wintherthur, tn., Swiss canton of Zürich, 17 m. by rail N.E. of the city of Zürich. It is a great railway centre, and possesses important factories, particularly of locomotives and other machinery. Pop. (1900) 22,462.

Winther, RASMUS VILLADS CHRISTIAN FERDINAND (1796–1876), Danish poet, born at Fensmark in Zealand; published (1828) his first volume of *Digte*; in 1841 was tutor at Neu-Strelitz to the future crown princess of Denmark. His *Nogle Digte* (1835), *Sang og Sagn* (1839), and *Haandtegninger* (1840) established his reputation as one of the leading lyrical poets of his country. His beautiful descriptions of nature are scarcely inferior to those of Wordsworth. Some of his finest work is contained in *Hjortens Flugt* (1853). He also wrote good short stories—e.g. *Tre Fortællinger* (1851). His *Samlkede Digtninger* appeared in 1860. See Bøgh's *Christian Winther* (1893–1901).

Winthrop Family, an American family, originating from England. The first was JOHN WINTHROP (1588–1649), governor of Massachusetts, born at Groton in Suffolk. He landed at Salem (1630), but removed to Charlestown, where he selected Shawmut as the site of Boston, and was governor of the new colony for many years, then deputy-governor. He opposed the doctrines of Anne Hutchinson and her followers, and was an active party to their banishment. See his *Journal*, 1630–49 (1720; by Savage, 1826, 1853); and *Life and Letters* (1864–7).—JOHN WINTHROP (1606–76), governor of Connecticut, born at Groton, son of preceding; took part in expedition (1627) for relief of Huguenots of Rochelle. He followed his father to America (1631), and became (1635) governor of Connecticut, afterwards founding the city of New London, of which he was governor (1657–76). Sent to England (1661), he procured a charter from Charles II., uniting Connecticut and New Haven into one colony, of which he was the first governor. He was an accomplished scholar, and one of the founders of the Royal Society of London.—FITZJOHN WINTHROP (1639–1707), son of the preceding, took part in the Indian wars; was agent in London for Connecticut (1693–7); and governor of the colony (1698–1707). See *The Winthrop Papers* (1889).—The next Winthrop of distinction was also a JOHN (1714–79), a mathematician and fellow of the Royal Society of London. He observed the transit of Venus at St. John's, Newfoundland (1761), and wrote treatises on earthquakes, and was a close friend of Benjamin Franklin.—ROBERT CHARLES WINTHROP (1809–94), orator, politician, and man of letters, a native of Boston; entered the State legislature (1835); was its speaker (1838–40); member of Congress (1840–2 and 1843–50); speaker again (1847–8); and senator (1850–1). He wrote *Addresses and Speeches* (1852 and 1867), *Life and Letters of John Winthrop* (1864–7), and *Memoir of Nathan Appleton* (1861).—THEODORE WINTHROP (1828–61), soldier and author, born at New Haven; visited California, Oregon and Vancouver Is., and accompanied the expedition of Strain to explore the isthmus of Darien. He became a barrister, and eventually military secretary to General Butler in the civil war, but was killed in the battle of Great Bethel in Virginia. He wrote, among other works, *Cecil Dreeme* (1861), *John Brent* (1862), *Edwin Brothertoft* (1862), *Canoe and Saddle* (1862), and *Life in the Open Air* (1863).

Winzet, or WINGATE, NINIAN (1518–92), Scottish controversialist, born in Renfrew. He became one of the most strenuous supporters of the Roman Catholic cause in Scotland, opposed John Knox, and published irritating polemical tracts and pamphlets. He was exiled in 1563, and instituted (1577) abbot of the Benedictine monastery at Ratisbon. He wrote a reply to Buchanan's *De Jure Regni*. See Scottish Text Society's reprint of his *Certain Tractates* (1891).

Wire and Wire-Drawing.

Nearly all metals can be drawn, the extent and ease of drawing depending upon the ductility of the metal. Such metals as antimony and bismuth, owing to their extreme hardness, can only be drawn with great difficulty, and are then of little or no use, owing to their want of flexibility. Numerous wires are composed of alloys, such as iron and carbon, making steel wire, iron-nickel, brass, iron-aluminium, and copper-nickel. Gold wire is mentioned in Exodus 39 as being used in the dress of the high priest. This was probably made by beating out the gold into thin sheets, then slitting it, and smoothing the edges of the strips, so as to give them a round form.

The *modus operandi* now in vogue for drawing iron and steel wire is as follows. The billets or ingots are heated to a bright red heat and passed through rollers with diminishing holes, being first rolled on the one side and then on the other, until they assume the form of a round wire rod of about $\frac{1}{2}$ in. in diameter. When the rod issues from the last roller, it is wound on to a rotating reel, and is then ready for the drawing process. It is first thoroughly cleaned, all the oxide or scale which adheres to it being removed by plunging into an acid bath. In high-class steel wire this is used cold, but in the cheaper grades, such as fencing wire, the acid is heated by steam. The rod is next well washed in water, and then dipped into boiling lime, to neutralize any acid that may still be left, and is dried quickly in a hot stove. The wire-drawer then takes it and puts one end into the die. In this hole are punched in the form of a sugar loaf, the end of the hole being very carefully finished to the right size. As it passes through the die, the wire is attached to a vice situated on the top of the block or drum, round which it is wound. When the hank of wire has all passed through the die, it is taken off the drum or block, and the same process is repeated until the desired size is obtained. The process of annealing consists of heating the

coils to a red heat in a hermetically sealed chamber, and allowing them to cool slowly. Every time this is done, it is necessary to clean the wire in the acid again before drawing. For some classes of iron and steel wire, the wire is coated after it has been cleaned in a bath of sulphate of copper to form a thin coating of copper.

There have been numerous machines invented for drawing wire through as many as twelve dies at one time, but these have only been successful for the softer and more ductile metals, such as brass and copper. Soft iron wire has also been drawn through a number of dies at one operation in the smaller sizes. In these machines the wire has to be drawn wet. For very fine wire, dies of precious stones, such as diamonds and rubies, are used. Commercially the standard sizes of wire conform to certain recognized gauges. That most commonly quoted is Birmingham wire gauge, which has some forty measurements, ranging from No. 0000/454-inch to No. 36/004-inch.



Wireworm (*Agriotes lineatus*).

Steel wires of great strength have been made of late years, 130 tons tensile strength per square inch being quite common. This class of wire is used for ropes, pianos, springs, and so forth. The wire is hardened and tempered to a nicety before the drawing process. This class of wire has also great toughness, and stands severe torsion and flexure tests. Wires of great length have been drawn without weld or joint. A silver wire 170 m. long has been drawn through a ruby which was $\frac{1}{300}$ of an inch in diameter. Platinum wire of great fineness has been drawn by covering the platinum with silver, then drawing this down as fine as practicable, and dissolving the silver off, leaving the platinum. This wire was calculated to be $\frac{1}{300000}$ of an inch in diameter, and was intended to take the place of spider lines in telescope and other scientific apparatus.

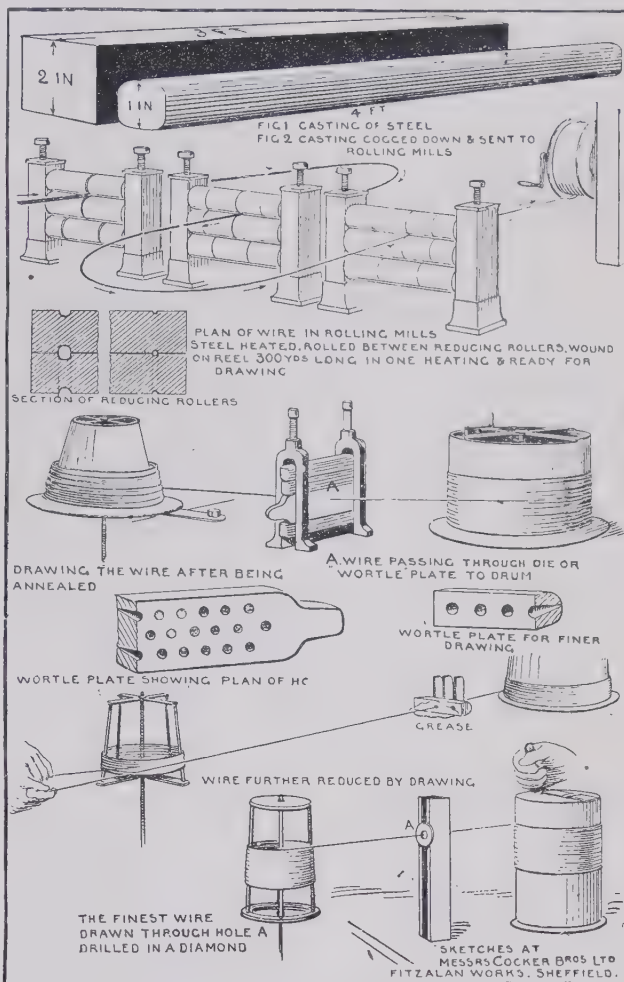
Although wire is mostly cylindrical in form, it is often drawn square, oval, half-round, flat, triangular, and as the grooved

pinion wire, from which the wheels of clocks and watches are cut. In weaving wire for netting, wirecloth, barbed wire, special automatic machinery is used, which takes the wire from the coil and turns out the finished article. Enormous quantities of copper wire are exported from Britain in the form of cables and

sizes are contracted, the steam enters at a less speed than that of the piston towards the end of its stroke, thus setting up the throttling effect.

Wireless Telegraphy. See ELECTRO-MAGNETIC WAVES.

Wireworm. (1.) A name given to the larvæ of click-beetles, on account of the shape of the body



Wire Manufacture.

dynamos for electrical work. Of late, aluminium wire has come into favour, owing to its lightness and high conductivity, and is being used in some cases in place of copper.

Wire-drawing, a term applied to the throttling of steam in the passages of the cylinder of a steam-engine. When these pas-

and the toughness and hardness of the skin. These larvæ are extremely destructive to all sorts of garden and field crops, upon whose roots or underground stems they feed. The larval life extends up to five years. The usual length of the larva is $\frac{1}{2}$ in. to $\frac{3}{4}$ in., and there are three pairs of legs. At the end of

larval life pupation takes place in the ground, from which the imago emerges. Common species are *Agriotes lineatus* and *A. sputator*. The natural enemies of the wireworm are the pheasant, the rook, the mole, and the plover. As remedies for their attacks, dressings of lime, salt, nitrate of soda, and so on, have been recommended; also trapping with slices of potato or turnip, a remedy obviously only applicable on a small scale. (2.) The name wireworm is also given to the destructive millipedes found in gardens, especially to species of *Iulus*.

Wiring, ELECTRIC. See ELECTRIC LIGHTING.

Wirsén, CARL DAVID AF (1842), Swedish poet, born in Uppland, taught at Upsala (1868-75). His chief works are *Dikter* (1876),

testify to its ancient greatness. The cathedral (1190-1225) is still preserved. The town exports corn, cement, chalk, and sugar. From the very earliest times it was a place of commercial importance. This position it owed to its central situation in the Baltic; and under the Hanseatic League it was independent and prosperous till destroyed by Valdemar IV. of Denmark in 1361. In those days it had a population of 20,000. It gave name to a code of sea-laws, compiled in the middle of the 13th century. Pop. (1900) 8,376.

Wisconsin, one of the northern states of the United States of America, with an area of 56,040 sq. m. It was organized as a territory in 1836, and admitted as a state in 1848. The surface presents little relief, except

paper and wood pulp. The mineral wealth consists mainly of iron ore, found in large quantities in the north-eastern part of the state. In the south-western part of the state lead and zinc are mined. Pop. (1900) 2,069,042, of whom the foreign-born numbered 515,971, or 24·9 per cent.

Wisconsin, riv., rises in N. of Wisconsin, and flows S. and S.W. to join the Mississippi, 3 m. S. of Prairie du Chien. It is 600 m. long, and is navigable to Portage (200 m.), whence it is connected by canal with Fox R. and Lake Michigan.

Wisdom, BOOK OF. See ECCLESIASTICUS and SOLOMON.

Wiseman, NICHOLAS PATRICK STEPHEN (1802-65), cardinal archbishop of Westminster, was of Irish extraction, but born at Seville. At sixteen he was entered at the English College at Rome, of which he became rector in 1828. He soon became known as an able lecturer, both in Rome and in London, making popular such subjects as 'The Connection between Science and Revealed Religion.' His discourses on the *Doctrine of the Catholic Church* attracted much interest in England (1835-6). In 1836 he established, in conjunction with Mr. O'Connell, the *Dublin Review*, to which he was a regular contributor. In 1840 he was made coadjutor vicar-apostolic of the central division of the Roman Catholic Church in England, with the title of bishop of Melipotamus; also president of St. Mary's College at Oscott. In 1846 he was transferred to London. When the Roman hierarchy was restored in England in 1850, Wiseman was made archbishop of Westminster and cardinal. His name was associated with art, culture, and progress. Among his lighter efforts is *Fabiola, or the Church of the Catacombs* (1854); and a drama, *The Witch of Rosenburg* (1866). See *Life* by Wilfrid Ward (1897; new ed. 1900).

Wiseman, RICHARD (?1622-76), English surgeon, was born in London. In 1643 he joined the royalist forces, and ultimately became medical attendant to the Prince of Wales. He was taken prisoner at Worcester (1651), and after his release practised in London, and engaged in conspiracies against the commonwealth. At the restoration he became surgeon to Charles II. He was one of the first of his profession to lift surgery above mere blood-letting. See Sir T. Longmore's *Biographical Study of Richard Wiseman* (1891).

Wishart, GEORGE (?1513-46), Scottish Protestant martyr, was probably the younger brother of James Wishart of Pittarrow in



Wisconsin.

Nya Dikter (1880), *Sånger och Bilder* (1884), *Toner och Sånger* (1893)—all remarkable for deep feeling, native piety, and rare perfection of style. In 1879 he was elected a member of the Academy. His further works include *Andliga Sånger* (1898), *Ellen Keys Lifsskildring och Verksamhet som Författarinna* (1900), and his own *Lefnadsteckningar* (1901).

Wisbech, munic. bor. and port, Cambridgeshire, England, 21 m. E.N.E. of Peterborough, on the Nene, here navigable for large vessels. Fruit is extensively grown. Birthplace of Thomas Clarkson, the abolitionist. Pop. (1901) 9,831.

Wisby, or VISBY, tn., cap. of isl. of Gotland, Sweden, and an episcopal see, on W. coast. The well-preserved ruins of its walls

minor features produced by the erosion and deposition of the Laurentian glacier, which also left its traces in the form of many lakes, ponds, and marshes. The northern part of the state was originally heavily forested with valuable white pine, much of which has been felled. The capital is Madison, but the chief city is Milwaukee. A large and rapidly growing city is Superior, at the head of Lake Michigan. The farming industries are very great, especially in the southern half of the state. The principal crops are oats, Indian corn, barley, wheat, rye, tobacco. The leading products of the manufacturers are lumber, flour, foundry and machine-shop products, cheese, butter, and condensed milk, leather, malt liquors, slaughtering and meat-packing,

Forfarshire. In 1538 he was summoned by Bishop Hepburn on a charge of heresy for teaching the Greek Testament, and fled to England. Either he or another of the same name in the following year recanted at Bristol on a charge of heresy for what was interpreted as denial of the merit of Christ, after which time he went abroad; and while in Switzerland he translated *The Confession of Faith of the Churches of Switzerland* (1548), reprinted in the *Wodrow Miscellany*, vol. i. (1846). About 1542-3 he was residing in Corpus Christi College, Cambridge; but in the summer of 1543 (not 1544, as stated by Knox) he returned to Scotland. He was arrested, 16th January 1546, while on a preaching tour in the Lothians. After trial at St. Andrews for heresy, he was condemned to death, and on 8th March he was strangled and burned. His preaching and martyrdom gave an impetus to the reformation doctrines. See *Knox's Works* (ed. Laing); *Foxe's Book of Martyrs*; *Rogers's Memoirs of George Wishart* (1876); *Cramond's Truth about George Wishart* (1898).

Wishart, GEORGE (1599-1671), bishop of Edinburgh, was born in Haddingtonshire; he acted as secretary to Archbishop Spotswood, and held charges first at Monifieth and then at St. Andrews, where he came under Montrose's influence. Wishart joined in the exodus when the period of Presbyterian ascendancy began (1638), and settled at New-castle, where he was taken prisoner and brought to Edinburgh (1644) and imprisoned. On his release he joined Montrose, was present at Philiphaugh, and fled with Montrose to the Continent, where he became minister of the Scots church at Schiedam. In 1662 he was appointed bishop of Edinburgh.

Wishaw, tn. and pol. bur., Lanarkshire, Scotland, 15 m. by rail. E.S.E. of Glasgow; has railway wagon works, blast furnaces, iron works, engineering works, and coal mines. Pop. (1901) 20,873.

Wislicenus, HERMANN (1825-99), German historical painter, born at Eisenach; was a pupil of Schnorr, also studied at Rome under Cornelius, and settled (1868) at Düsseldorf as a professor at the academy. He is chiefly known for his mural decoration—e.g. that of the Goslar Imperial Hall and the staircase of the Weimar Museum. Among his other works are *The Four Seasons*, *Fancy Borne by Dream Gods*, and *Germania Keeping Watch on the Rhine*.

Wislicenus, JOHANNES (1835-1902), German chemist, was born

near Querfurt in Thuringia, and in 1865 was appointed professor of chemistry at Zürich; in 1872 succeeded Strecker in Würzburg, and in 1885 Kolbe in Leipzig. His work was almost entirely in the field of organic chemistry, chiefly in connection with the spatial relations of the atoms in the molecule, a theory which his researches did much to establish and develop. He published *Die räumliche Anordnung der Atome in organischen Molekülen* (1887). See Perkin's Memorial Lecture, in *Journal of the Chemical Society* (1905).

Wismar, seapt. tn., Mecklenburg-Schwerin, Germany, at head of bay of same name, 18 m. N. of Schwerin; has shipbuilding and fishing, and manufactures of sailcloth, tobacco, and paper. It belonged to Sweden (1648-1803). Among many ancient buildings is a 14th-century church. Pop. (1900) 20,222.

Wissembourg. See **WEISSENBURG**.

Wissmann, HERMANN VON (1853-1905), German African explorer, born at Frankfurt-on-the-Oder; started on a journey of exploration in Africa with Dr. Pogge (1880-2), when he discovered the Sankuru R. In 1883-4 he made a thorough examination of the Congo region on behalf of the Belgian government, reaching Lulua, where he founded the station of Luluaburg (1884). He made a new incursion into equatorial Africa (1886-7), when he explored the sources of the Lomami, Kassai, and other rivers. He quelled a native revolt in German E. Africa (1888-91), and was governor of the colony (1895-6). He wrote *Im Innern Afrikas* (1888), *Unter Deutscher Flagge quer durch Afrika* (1889), and *Meine Zweite Durchquerung Equatorial Afrikas* (1891).

Wistaria, a genus of hardy climbing shrubs belonging to the order Leguminosæ. They bear imparipinnate leaves with entire leaflets, and usually racemes of blue flowers, followed by longish pods. They thrive in rich well-drained soil, and make excellent wall or trellis plants. The species most often grown is *W. chinensis*, the Chinese kidney bean tree, of which there are several varieties, but *W. frutescens* and *W. japonica*, are equally desirable. The last-named is a white-flowered species.

Witchcraft. In their original sense, the words 'witch' and 'wizard' denoted the possessors of knowledge, or wise people. Much of the witchcraft of Europe was derived from the science of the Magi, or the magicians of ancient Chaldæa and Persia. A notable phase of

this was 'sympathetic' or 'imitative' magic, which, in one particular form, has persisted in Europe to the present day. This consisted in the practice of making a waxen effigy of a person whom it was desired to injure, and when the figure was placed before a fire and the wax began to melt, so the actual body of the person represented was believed to waste away simultaneously. From Chaldæa the custom passed into Egypt, and then into Greece and Rome. But it is more than probable that Chaldæan science was originally something more than mere superstition and trickery. Mr. J. W. Brodie-Innes (*Scottish Witchcraft Trials*, 1891) suggests that hypnotism played an important part in such practices; and the figure may have aided the hypnotist in concentrating his powers. There are cases of the existence of this practice in the Scottish Highlands (the image being a *corp chréidh*, or 'clay body'), as recently as the latter part of the 19th century. Sympathetic magic of this kind is practised also in India, Further India, Malaysia, and N. America.

Other aspects of witchcraft are considered in the articles CONJURING, DIVINATION, INCANTATION, and MAGIC. One conclusion to be drawn from a study of its various phases is that, however degraded and contemptible it ultimately became, the science of witchcraft was originally a well-matured system, and that it owed its downfall to the religious factors contained in it. For it is evident that the early Hebrew enactments against witchcraft denoted a struggle between two conflicting sets of ideas. And this struggle was continued in Christian times. When, for example, those people of Ephesus who 'practised curious [or magical] arts brought their books together and burned them in the sight of all,' as a result of the preaching of the apostle Paul (Acts 19:19), they clearly showed that those books admitted principles which were opposed to the Pauline doctrine. Presumably they recognized the worship of the Evil Principle, otherwise Ahirman, to whom the Magi offered sacrifices. 'Herodotus tells us,' observes Lenormant, 'that the spouse of Xerxes, who was entirely under the influence of the Magi, sacrificed seven children "to the god of darkness and the infernal regions." He also mentions a like sacrifice as having been offered to the same god in the passage of the Strymon, when the Persians were marching into Greece.' Devil-worship was always one of the accusations laid against those who practised witch-

craft, and a preliminary step in the acquirement of the black art was to sell one's soul to the devil. Pope Innocent VIII., in a bull issued against wizards and witches, accuses them of having intercourse with the infernal fiends. The associates of Doctor Fian, who was burned at Edinburgh in 1591 for sorcery, confessed to having paid homage to the devil. Many so-called confessions made by people accused of witchcraft were, however, drawn from them by means of torture, and it is therefore impossible to accept many of their statements as true.

The histories of the various countries of Europe teem with accounts of the trial and, in most cases, the conviction and execution of people supposed to be sorcerers. Sectarian rancour, private hatred, and political spite were frequently the motives which actuated the accusers. To brand a heretic as a wizard was often the easiest way of disposing of him; and the Puritan settlers of New England evinced the same narrow and relentless spirit as their Roman Catholic congeners in the Old World, with the same disastrous result to those accused of witchcraft. See SCOT'S *Discoverie of Witchcraft* (1584), Wright's *Narratives of Sorcery and Magic* (1852), Scott's *Letters on Demonology and Witchcraft* (1830), Adams's *Witch, Warlock, and Magician* (1889), Leland's *Gypsy Sorcery* (1891), Sharpe's *History of Witchcraft in Scotland* (1884), and Pitcairn's *Criminal Trials* (1830-3).

Witch-hazel, a term applied to certain shrubs and small trees, one of which is a native of America, the others natives of Japan. From the bark and leaves of the American species an astringent principle is obtained, which is much employed in medicine. This species is often cultivated in gardens as an ornamental shrub. It bears axillary clusters of bright yellow flowers throughout the autumn and winter.

Witch Knots, the crowded clusters of small twiggy branches, like a rook's nest, that sometimes occur on the larger branches of the birch, hornbeam, bullace, and other trees. They are due to the activity of certain fungi of the group of Ascomycetes. Thus *Exoascus Carpinii* causes witch knots on the hornbeam, *E. turgidus* on the birch, and *E. institiae* on the bullace. Excision is the only successful treatment.

Witenagemôt, the Anglo-Saxon great council. As the small kingdoms of the heptarchic period coalesced under the rule of Wessex, the king of Britain created an assembly of the leading men of the kingdom to whom he might look for counsel. The

Witenagemôt was composed of the wise men, the bishops, the ealdormen of the shires, and the king's friends. This body took part in legislation; its consent was necessary to royal grants of land; it exercised judicial powers as a court in the last resort; it gave its consent to taxation imposed by the king; its advice was asked on all questions concerning peace and war, the army, and the fleet. In theory, it had a consultative voice in all matters of importance; but in practice it had little influence, unless the king desired to be guided by its advice. In theory, the Witenagemôt always elected the kings and could depose them; but as the feudal principle advanced, the king had little to fear from a body which could be swamped by his own personal dependants. Freeman held the view that the Witenagemôt was in reality an assembly of representatives from the shire courts, and that every freeman retained in theory the right of appearing in the assembly of the nation. Stubbs is strongly opposed to this view, and declares that the Witenagemôt was a creation of the 8th century, and was never a body of representatives. See PARLIAMENT; also Stubbs's *The Constitutional History of England*, Freeman's *History of the Norman Conquest*, Gneist's *English Constitutional History* (1886).

Wither, GEORGE (1588-1667), English poet, born at Bentworth, Hants. He settled in London about 1610, and in the congenial fellowship of William Browne and Michael Drayton he took to letters, and wrote lyrics, pastorals, and satires. Certain political allusions in his *Abuses Stript and Whipt* (1613) brought him to the Marshalsea in 1613. His later productions are tediously satiric or tediously pietistic. He was again in trouble for a political allusion in 1621. In 1639 he served against the Scots, and on the outbreak of the civil war raised a troop of horse for the Parliament. His house was sacked by royalists, and his remaining years were full of vicissitude. His poems include *Prince Henri's Obsequies* (1612); *Epithalamia* (1612); *Fidelia* (1617); *Shepherd's Hunting* (1615); *Wither's Motto* (1621); *Faire-Virtue, the Mistress of Philarete* (1622); *Hymns and Songs of the Church* (1623); *Britain's Remembrancer* (1628); *Halelujah* (1641). There are collections (all incomplete) of his *Works* (1620); *Juvenilia* (1622; ed. Brydges, 1814-18; ed. Spenser Society, 1871-82; ed. H. Morley, 1891; ed. F. Sidgwick, with good Life, 1902).

Witherspoon, JOHN (1722-94), Scottish Presbyterian divine, was

born in Haddingtonshire. On being ordained minister of Beith (1745), he attached himself to the Evangelical party. His *Ecclesiastical Characteristics* (1753) was as witty as his *Doctrine of Justification* (1756) was learned and sound; in 1765 his *History of a Corporation of Servants* repeated the humour and the success of his *Characteristics*. In 1768 he accepted the principalship of Princeton College in New Jersey, and by his enlightened zeal laid the foundations of its prosperity. He adopted the colonial side in the controversies which led to the war of independence. His *Works* were published in 9 vols. (1815).

Witkowitz, tn., Austria, in extreme N.E. of Moravia, 23 m. S. of Ratibor (Prussian Silesia); with coal mines and iron works. Pop. (1900) 19,128.

Witness. See EVIDENCE.

Witney, mrkt. tn., Oxon, England, 11 m. W. by N. of Oxford; with manufacture of blankets. Pop. (1901) 3,574.

Witt, DE. See DE WITT.

Witte, KARL (1800-83), German jurist and Italian scholar, born at Lochnau, near Halle, was a prodigy of learning as a boy. He was sent by the king of Prussia to Italy to examine the museums and libraries, and on his return was appointed to the chair of law at Breslau (1823), which he exchanged for a similar chair at Halle (1834). Among his works are *Das Preussische Testamentbrecht* (1838), a translation of *The Decameron* (1843), and of Dante's lyrical poems (1842-3), a critical edition of the *Divina Commedia* (1862), and a translation of the same (1865), and other Dante works.

Witte, COUNT SERGIUS JULIE-VITTH DE (1849), Russian statesman, was born at Tiflis. During the Russo-Turkish war of 1877-8 he was director of the South-Western Rys. In 1888 he became director of the railway department at the Ministry of Finance, in 1892 minister of communications, in 1893 minister of finance, and in 1903 was made president of the committee of ministers. He was the chief Russian plenipotentiary in the peace negotiations with Japan (1905), and for a short time after his return was the principal minister of the Czar.

Wittenberg, tn., prov. Saxony, Prussia, on R. bk. of Elbe, 55 m. by rail S.W. of Berlin; has manufactures of cloth, hosiery, leather, and machinery. It was the 'cradle of the reformation.' Luther was a professor in the university. The castle church (restored in 1892) contains the tombs of Luther, Melancthon, Frederick the Wise, and John the Steadfast, and on its old doors (now replaced) Luther

naild his ninety-five theses against indulgences; his house is still preserved; the spot (outside the Elster Gate) where he burned the papal bull is pointed out; his statue, in bronze, by Schadow, stands in the market-place. The university was incorporated with that of Halle in 1815. Pop. (1900) 18,345.

Witu, or **VITU**, a sultanate in the British protectorate of E. Africa, extending along the Indian Ocean and enclosed by the Lamu district. Area, 1,200 sq. m. Capital, Witu (pop. 6,000). A large part of the sultanate is covered with rubber-producing forests. It is mainly inhabited by Swahilis, descendants of runaway slaves and outlaws.

Witwatersrand. See **RAND**.

Wladimir. See **RUSSIA**.

Wlislöckl, **HEINRICH VON** (1856), Hungarian writer, born at Kronstadt, Transylvania, is the author of many works on the customs, folklore, and language of the Hungarian gypsies—e.g. *Märchen und Sagen der transsilvanischen Zigeuner* (1886); *Vom wandernden Zigeunervolk* (1890); *Aus dem innern Leben der Zigeuner* (1892); and *Volks Glaube und religiöser Brauch der Zigeuner* (1892).

Wrocław, **W.**, Warsaw gov., Russian Poland, 83 m. W.N.W. of Warsaw city, on the Vistula; is an episcopal see and a river-port, with grain trade, breweries, iron works, pottery, and chicory manufactures. Pop. (1897) 23,065.

Woad, a product obtained by the partial fermentation of the leaves of the woad plant (*Isatis tinctoria*). It contains about two per cent. of indigo, and was formerly used as a dye itself, but is now mainly employed to set up the reductive fermentation utilized in dyeing by means of indigo. The plant is still cultivated on a small scale near Boston in Lincolnshire, there being a small factory at Algbarkirk.

Woburn. (1.) Market tn., Bedfordshire, England, 11 m. N.W. of Luton. Pop. (1901) 1,129. Woburn Abbey, the principal seat of the Duke of Bedford, occupies the site of a Cistercian abbey, founded in 1145 by monks from the abbey of Fountains in Yorkshire. The last abbot, Robert Hobbs, was, according to tradition, hanged on an oak in the park in 1538. In 1547 the lands were granted to John, Lord Russell, afterwards Earl of Bedford. The present mansion, which was erected in the 18th century, contains a magnificent collection of portraits and other works of art. The pleasure-grounds and gardens were famous in the early years of the 19th century. (2.) City, Middlesex co., Massachusetts, U.S.A., 10 m. N.N.W. of Bos-

ton; with manufacture of boots and shoes. Pop. (1900) 14,254.

Wodehouse, **JOHN**. See **KIMBERLEY**, **EARL OF**.

Woden. See **ODIN**.



Woad (*Isatis tinctoria*).

1, Flower; 2, pistil and stamens; 3, fruit.

Wodrow, **ROBERT** (1679-1734), Scottish ecclesiastical historian, was born in Glasgow, and in 1704 appointed minister of Eastwood in Renfrewshire, where he remained the rest of his life. He was noted as a preacher, and took an active part in the ecclesiastical politics of his day, his sympathies being with the Evangelical and anti-Patronage party. In 1721-2 appeared his chief work, *The History of the Sufferings of the Church of Scotland from the Restoration to the Revolution*, a sympathetic account of the Covenanters. He left much material in MSS., including *Lives of the Scottish Reformers* (1834-45, by Maitland Club), *Analecta* (1842-3, Maitland Club), some of his *Correspondence* (1842-43; Wodrow Society), and *Biographical Collections Relating to the North-East of Scotland* (1890, New Spalding Club).

Woermann, **KARL** (1844), German art historian and poet, born in Hamburg. After some years of travel he was appointed professor of art and literature at Düsseldorf (1874), and in 1882 became director of the picture gallery at Dresden. His writings include *Kunst- und Natur-skizzen aus Nord- und Süd-Europa* (1880), *Was uns die Kunstgeschichte lehrt*

(new ed. 1894); and, with Woltmann, a *Geschichte der Malerei* (1878). Among his poetical works are *Neue Gedichte* (1884), *Zu Zweien im Süden* (1893), and *Deutsche Herzen* (1896).

Woffington, **PEG** (c. 1720-60), Irish actress, was born at Dublin. She appeared in England first at Covent Garden, in 1740, and soon became distinguished as a charming exponent of comedy. Her beauty and grace took London by storm. Garrick himself was supposed to be seriously attached to her. She atoned for moral faults by a warm heart and sincere charity. She left the stage on May 3, 1757, after a breakdown in the part of Rosalind. She founded almshouses at Teddington. See *Lives* by Daly (1884) and Molloy (1888), and Charles Reade's novel *Peg Woffington*.

Woguls, or **VOGULS**, branch of the Ugrian Finns, closely allied to the West Siberian Ostiaks. They occupy principally the eastern slopes of the Ural range. Since 1722 they have been nominal Christians, but are still Shamanists at heart. Pop. (1904) from 20,000 to 30,000.

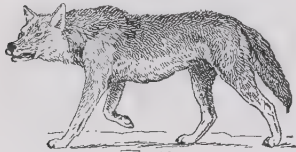
Wöhler, **FRIEDRICH** (1800-82), German chemist, was born near Frankfort-on-Main. Influenced by Gmelin, he gave up medicine for chemistry, and then studied with Berzelius. In 1825 he was appointed teacher of chemistry in the Berlin technical school, proceeding in 1831 to a similar post at Kassel, where he remained till 1836, when he was chosen professor of chemistry in Göttingen—a chair he retained for the rest of his life. The most far-reaching of Wöhler's many researches was that on cyanic acid, in which he discovered that it was possible to prepare, by laboratory methods from inorganic materials, products that it was previously thought could only be formed in living organisms. At the same time he discovered the phenomenon of isomerism, a principle that has led to most fruitful results. Wöhler was also the first to prepare aluminium and boron, and to discover along with Liebig the classes of compounds known as glucosides and enzymes. He published *Grundriss der organischen Chemie* (1831), *Grundriss der organischen Chemie* (1832), and *Praktische Übungen in der chemischen Analyse* (1854). See Hofmann's *Zur Erinnerung an F. Wöhler* (1883).

Woking, **tn.** and health resort, Surrey, England, 6 m. N. of Guildford. In the district are an Oriental Institute and Mohammedan mosque, boys' industrial school, home for disabled soldiers and sailors, barracks occupying former convict prisons, and a lunatic asylum. Woking cemetery (500

acres), with crematorium, lies $3\frac{1}{2}$ m. w. Pop. (1901) 16,244.

Wokingham, or OKINGHAM, munic. bor. and mrkt. tn., Berkshire, England, 7 m. E.S.E. of Reading. The parish church is an ancient building, and there are almshouses founded in 1451. New almshouses were erected in commemoration of Queen Victoria's jubilee. The town hall and public offices and county police station are modern. Wokingham was anciently known as 'chief town of Windsor Forest,' and was for several centuries the civil centre of that district. Wokingham is the last place in the country where bull-baiting was practised, about 1840. Pop. (1901) 3,551.

Wolcot, JOHN, or PETER PINDAR (1738-1819), English pamphleteer, was born at Dodbrooke in Devonshire. He went to Jamaica as personal physician to Sir William Trelawny. On his return to England he settled in Cornwall, at Truro and Helstone, until 1779, when he took up his residence in London. There he quickly became famous for his satires, characterized by pungent and raucy humour, of which *The Lousiad* may be taken as an example.



Common Wolf.

Wolf (*Canis lupus*), the largest living member of the family Canidae, with the exception of some domesticated dogs. The common wolf is found over the whole of the northern hemisphere, but is absent from Africa and S. America, though the Falkland Is. have a wolf of their own. In Europe it reaches a length of about three and a half feet, exclusive of the tail, which is less than half as long. The colour is generally rufous or yellowish gray above, with some black, and the under surface is whitish. The under fur is woolly and of a slaty-brown colour. The wolf has long legs, a lank body, erect ears, and a long bushy tail, which hangs downwards between the haunches, and is not curled up towards the tip. In N. America it has less red in its coloration than the average European form. Wolves are usually nocturnal in their habits, spending the day in the den, which may be a cave, a hollow tree, or even a burrow. Contrary to the common belief, wolves are for much of the year solitary or found in pairs; but at certain seasons, especially in winter, they

live together in packs, and combine to bring down their prey. Such packs are exceedingly destructive, sometimes killing large numbers of sheep or deer, and leaving the carcasses almost untouched. Almost any kind of animal food, fresh or in state of carrion, is acceptable, while when hard pressed it is said that the animals will eat frogs and even vegetable food. Birds are constantly eaten. The intelligence and power of learning by experience is great: wolves which live in a region where they are much persecuted show extraordinary cunning in avoiding traps. The young are born in the spring, and number from six to ten in a litter. They usually remain with their parents till the end of the year. The natural cry is a loud and continuous howl, but wolves kept in captivity soon learn to bark like dogs. When taken young the wolf may be readily tamed. The animals were formerly abundant throughout the British Isles. According to Harting, the wolf in England became extinct in the reign of Henry VII., in Scotland in 1742, and in Ireland about 1770.

The wolf of India has been made a separate species as *C. pallipes*, on account of the smaller size, slighter build, shorter fur, and the absence of under fur. It is confined to India south of the Himalaya, is found only in small packs, and is rather silent. This wolf in certain parts of India still takes a yearly toll of children's lives, while there are many stories of children being brought up by wolves, none of which have been authenticated, though the tradition seems almost world-wide. Another wolf is *C. antarcticus* of the Falkland Is., now stated to be extinct. This wolf is or was silent, not gregarious, and largely diurnal in habits. For the prairie wolf see COYOTE. See Mivart's *Dogs, Jackals, Wolves, and Foxes* (1890), and Harting's *British Animals Extinct within Historic Times* (1880).

Wolf, FERDINAND (1796-1866), Austrian literary historian, was born at Vienna, and entered the imperial library at Vienna as scribe in 1819, becoming later *custos*. When the Viennese Academy of Sciences was founded, in 1847, he was made member and secretary. Between 1833 and the date of his death Wolf wrote incessantly—mostly on Spanish, Portuguese, Brazilian, and Old French literature; and he illuminated everything he touched. His most important papers were collected in book form (the latest volume was edited by Stengel in 1890). In 1859 he founded, with Ebert, the *Jahrb. für rom. und*

engl. Lit. The notes he wrote for Julius's translation of Ticknor's *Spanish Literature* (1852; supplement edited by his son, Adolf, 1867) were incorporated in the later English editions.

Wolf, FRIEDRICH AUGUST (1759-1824), German scholar, originator of the Homeric question, was born near Nordhausen, and was a schoolmaster from 1779 to 1783; his edition of Plato's *Symposium* then won him a professorship at Halle (1783). There he founded the science of philology, by which he meant 'the knowledge of human nature as exhibited in antiquity;' it was to be studied from literature, art, laws, monuments, and indeed any existing records of a nation. In 1789 he published an edition of the *Leptines* of Demosthenes, and in 1795 his *Prolegomena* to Homer. In this work he denied that the poems of Homer could have been originally produced in their present form, mainly because (1) writing was unknown; (2) there was no public to which such a long work could appeal; and (3) Pissistratus was said to have arranged the scattered works of Homer. In fact, he believed that the Homeric poems were originally short ballads, only united into a continuous epic in the 6th century B.C. (See HOMER.) His career at Halle was ended in 1807 by the French invasion; the rest of his life was spent at Berlin. For some time he was employed in the department of education; then again he held a professorship. His most finished work is the *Darstellung der Altertumswissenschaft* (1833). See *Life*, in German, by Körte (1833), and by Varnhagen von Ense (1875).

Wolf, or WOLFE, JOHANN CHRISTIAN VON (1679-1754), German philosopher, born at Breslau, became (1707) professor of philosophy at Halle. Driven from there in 1723 by religious opposition, he obtained a chair at Marburg, but was recalled to Halle by Frederick the Great in 1740. Although Wolf's philosophy was very influential in the 18th century, it had no originality or depth. His leading ideas were taken from Leibniz, but they lost much of their profounder philosophical import in the process of popularization. See *C. Wolff's eigne Lebensbeschreibung* (1841), ed. Wuttke.

Wolfe, CHARLES (1791-1823), author of *The Burial of Sir John Moore* (1817), was born at Blackhall, Co. Kildare, Ireland, and became curate of Ballylog, then rector of Donoughmore. His literary remains were published in 1825, with *Life*.

Wolfe, JAMES (1727-59), British general, was born at Westerham, Kent. He first distinguished him-

self at the battle of Dettingen (1743). He gained still further distinction at the battle of Culloden in Scotland (1746), and of Lawfield in Belgium (1747). Pitt appointed Wolf to lead the land expedition against Quebec. His little army, on the night between the 12th and 13th September, having descended the St. Lawrence in boats and stealthily scaled the Heights of Abraham, was discovered at dawn by the astounded French commander, Montcalm, drawn up in battle array before Quebec. The fighting was of a desperate character. Wolfe himself was mortally wounded, but the capture of Quebec wrested Canada from France. See R. Wright's *Life and Correspondence of Major-general James Wolfe* (1864), Parkman's *Montcalm and Wolfe* (1885), and Abbé Casgrain's *Wolfe and Montcalm*, Makers of Canada Series (1906).



James Wolfe.

(In the National Portrait Gallery.)

Wolfenbüttel, anc. *tn.*, Brunswick, Prussia, on the Oker, 7 m. by rail s. of Brunswick; has manufactures of machinery and copper goods, cloth, preserves, and leather. Lessing was librarian (1770-81) in the ducal library, rebuilt in 1887. An old castle with a tower, a theatre, and the house in which Lessing wrote *Nathan der Weise*, now a museum, are the prominent buildings. One of the old churches contains the tombs of some of the princes of Brunswick. Pop. (1900) 17,873.

Wolff, SIR HENRY DRUMMOND (1830), English diplomatist, entered the Foreign Office in 1846. After diplomatic service abroad he entered Parliament for Christchurch (1874-80) and Portsmouth (1880-5), and for a time was one of the 'Fourth Party.'

From 1892 to 1900 he was ambassador at Madrid. He has published *The Mother Country and the Colonies* (1869), a translation of Lesseps's *History of the Suez Canal* (1876), and *Some Notes of the Past* (1893).

Wolff, JOSEPH (1795-1862), missionary, was the son of a Jewish rabbi, and was born near Bamberg. He came to England (1821), and became a Protestant. He was sent out to the East as a missionary, and began a nomadic career over south-western Asia, records of which he published in *Mission to Bokhara* (1845) and *Travels and Adventures* (1860). He returned to England in 1844, and settled down as a vicar in Somersetshire.

Wolff, KASPAR FRIEDRICH (1733-94), German anatomist and physiologist, born at Berlin, and was called (1763) to St. Petersburg to fill the chair of anatomy and physiology in the university. He wrote works on *Generation* (1759), *The Formation of the Intestinal Canal* (1768), and *Memoirs on the Structure of the Heart*.

Wolffian Bodies, or **MESONEPHROS**, are fetal structures which excrete urea before the formation of the permanent kidneys. After the permanent kidneys are developed, the greater part of the Wolffian body disappears; but a portion shares in the formation of the generative organs—the ovaries in the female, and the testicle in the male.

Wolf-fish, or **SEA-WOLF** (*Anarrhichas lupus*), a large fish belonging to the blenny family. It is abundant off parts of the Scottish coast. It may reach a length of six feet, and receives its popular names from the great development of the teeth. Some are conical like the canines of a wolf, some tuberculated, some flattened and pavement-like. The food consists of molluscs and crustaceans. In general appearance the fish resembles the other blennies, except in size. Its appearance and the peculiar smell prevent it from being sent to market in Britain. In Greenland and Iceland it is, however, like its near allies, an important article of food.

Wolf-hound. See **BORZOI**.

Wolfram. See **TUNGSTEN**.

Wolfram von Eschenbach (early 13th century), the most famous of the German minnesinger, was one of the poets welcomed by the Landgrave Hermann of Thuringia at the Wartburg. *Parzival*, his principal poem, falls within the opening years of the century, and the *Willehalm*, which he left unfinished, in 1216. The date of his shorter works, the *Titarel* fragments and the *Tag*

(or *Wächter*) *Lieder*, is uncertain. The birth and burial place of the poet has been identified with Obereschenbach in Franconia. The *Parzival*, a version of the Perceval grail quest, is not only the finest of the Grail romances, but is the most individual and characteristic work of mediæval literature previous to Dante. From book iii. to the middle of book xiii. (inclusive) it agrees closely with the *Perceval* of Chrétien de Troyes; but it possesses an introduction and a concluding portion to which no parallel has hitherto been found. In this poem the Grail is a stone. The swan-knight, Lohengrin, is Parzival's son, the grail-bearer becomes the mother of Prester John, and the whole poem bristles with allusions to Oriental philosophy and legend. Wolfram states that the source he followed was a poem by one Kiot, the Provençal. It was long contended that Wolfram really knew no other version than Chrétien's, and that Kiot was a feigned source. Dr. Paul Hagen, in *Der Grail*, proves the authenticity of the numerous allusions to Oriental works, and identifies the Grail with a bætulus or meteoric stone, and thus has practically established the general correctness of Wolfram's statement, though Kiot himself has not yet been identified. Wolfram's works show great depth of thought and extreme beauty of conception, while the moral and spiritual teaching is throughout far in advance of his age, and indeed curiously in harmony with modern ideals. In the poem of the *Wartburgkrieg* Wolfram von Eschenbach is represented as contending with the heathen magician Klingsor. Richard Wagner has introduced Wolfram as a leading character in *Tannhäuser*, and based his *Parsifal* upon Wolfram's masterpiece.

See *Wolfram von Eschenbach's Parzival und Titarel*, ed. by E. Martin (1900-3)—text and exhaustive commentary; *Wolfram von Eschenbach*, ed. Lachmann (5th ed. 1891, being the standard text); *Parzival und Titarel*, ed. Bartsch (1875-7), in *Deutsche Klassiker des Mittelalters*, vols. ix.-xi.—this edition contains notes and glossary, Lachmann's does not; *Parzival und Titarel*, ed. Karl Simrock (1883)—a modern German rendering, very close to original text; *Parzival*, by W. Hertz (1898)—modern German, more poetical than Simrock, but less faithful; *Parzival*, by J. L. Weston (1894)—English verse translation; *Der Grail*, by Paul Hagen (1900)—a discussion of the nature of the Grail stone, and examination of the Oriental

references—and his *Wolfram und Kist* (1906); *Das Hohelied vom Rittersum*, by G. Böttcher (1886)—on the ethical teaching of the poem; *Legends of the Wagner Drama*, by J. L. Weston (1896).

Wolfsbane. See ACONITE.

Wolf-spider, a name for the tarantula. See SPIDER.

Wollaston, WILLIAM HYDE (1766–1828), English chemist and physicist, was born at E. Dereham, Norfolk, and appointed fellow of Caius College, Cambridge, in 1787. He commenced the practice of medicine at Bury St. Edmund's in 1789, and in London in 1797, but retired from the profession in 1800 to devote himself to scientific research. Amongst his important discoveries were those in connection with the platinum metals, including



Viscount Wolseley.

(Photo by London Stereoscopic Co.)

palladium and rhodium, of which the method of making platinum malleable brought him a considerable fortune. He also made investigations in connection with Dalton's atomic theory, which he endeavoured to replace by a system of equivalents. Wollaston made considerable advances in optics, inventing methods of determining the refractive power of materials, the camera lucida, the reflecting goniometer, and improvements in lenses and prisms; whilst he did much to establish the truth of the wave theory of light. Further, he was the author of important discoveries in electricity and pathology, independently investigated the principle of the Davy lamp, and invented the method of drawing very fine wires. His papers

were published in the *Philosophical Transactions* (1809–39). He was secretary of the Royal Society from 1806, and a commissioner of the Royal Society on the Board of Longitude. He founded the Wollaston medal of the Geological Society, and the donation fund of the Royal Society.

Wollongong, seapt. tn., co. Camden, N.S.W., 49 m. s. of Sydney. Pop. (1901) 3,524.

Wollstonecraft, MARY. See GODWIN.

Wolseley, GARNET JOSEPH WOLSELEY, VISCOUNT (1833), British field-marshal, was born in Co. Dublin. His first experience of active service was in the second Burmese war (1852–3), when he was severely wounded while leading a storming party against a Burmese stronghold. In the Crimea he served in the trenches until Sebastopol was taken, and was again severely wounded (Aug. 30, 1855). In India (1857–9), during the mutiny, he shared in the siege and capture of Lucknow, and took part in all the engagements fought by the force under General Sir Hope Grant. After further experience in the Chinese war (1860), he, in 1870, commanded the Red River expedition in Canada against the rebel Louis Riel. Four years later he commanded the expedition against the king of Ashanti (King Coffee). In S. Africa Wolseley completed the subjugation of the Zulus, conquered Sekukuni's hostile nation, subdued the disaffected Boers, and completed the annexation of the Transvaal. In 1882 he crushed in Egypt the revolt of Arabi Pasha in the decisive battle of Tell-el-Kebir. For this he was raised to the peerage as Baron Wolseley. Lord Wolseley's last active undertaking was the gallant but unavailing effort to relieve General Gordon at Khartum (1884–5). For this he was created (1885) Viscount Wolseley. He was raised to the rank of field-marshal in 1894, and on the retirement of the Duke of Cambridge became commander-in-chief of the army (1895–1900). His publications include *The Soldier's Pocket-book for Field Service* (5th ed. 1886), *Life of the Duke of Marlborough* (1894), *The Decline and Fall of Napoleon* (1895), and *The Story of a Soldier's Life* (1903). See *Memoir*, by Low (1878).

Wolsey, THOMAS (1471–1530), English cardinal, was born at Ipswich. He became a fellow of Magdalen College, and remained in Oxford till 1500, when he took the living of Lymington in Somerset, and in 1501 was made chaplain to Archbishop Deane at Canterbury. Henry VII. employed him on several diplomatic mis-

sions, and made him dean of Lincoln. On Henry VIII.'s accession, Wolsey was appointed a member of the king's council, and almoner in 1511. Wolsey had already received the bishopric of Tournai; he was now made (1514) bishop of Lincoln, and a little later archbishop of York. His rapid rise was due to his skill in diplomacy and foreign policy. He was an advocate of the balance of power, and during the early wars between the Emperor Charles V. and Francis I. of France he endeavoured to prevent either king from obtaining an undue advantage. In 1515 Wolsey succeeded Warham as lord chancellor, and in 1518 was created cardinal-legate by Pope Leo X. Wolsey now endeavoured to secure for his country the position of arbiter between Francis



Thomas Wolsey.

(The portrait by Holbein, in Christ Church, Oxford.)

and Charles. In June 1520 Henry VIII. met Francis at the 'Field of the Cloth of Gold,' and shortly afterwards he met Charles at Gravelines. In the inevitable war, which broke out in 1521, England sided with Charles. Wolsey hoped by the aid of the emperor to secure the papacy. The invasions of France in 1522 and 1523 by the English proved failures, and the friendship between England and the emperor cooled. Charles V.'s victory at Pavia (1525) alienated the English, and was followed by an alliance between England and France (1527). Wolsey had been disappointed in his hopes of the papacy. During these years Wolsey had shown his zeal for reform and for learning by his foundation of Cardinal (afterwards Christ Church) College, Oxford, and of a college at Ipswich. His further

designs were, however, checked by the divorce question. Henry wished to divorce Catherine of Aragon, and Wolsey endeavoured to induce the papacy to declare the king's marriage invalid. But Clement VII. was in the power of Charles V., the nephew of Catherine, and Wolsey failed (1529). Henry thereupon deprived him of his chancellorship, accused him of having broken the Statute of Præmunire, and forced him to retire to his diocese of York. Summoned to London, Wolsey died on his way at Leicester Abbey. See Creighton's *Cardinal Wolsey* (1888), and Cavendish's *Life of Wolsey* (new ed. 1885).

Woltmann, ALFRED (1841-80), German historian, born at Charlottenburg; was successively professor of art history at Karlsruhe (1868), Prague (1874), and Strassburg (1878). His works include *Holbein und seine Zeit* (2nd ed. 1874-6), *Die Deutsche Kunst und ihre Reformation* (2nd ed. 1871), *Aus vier Jahrhunderten Niederländisch-Deutscher Kunstgeschichte* (1878); and with Woermann, a *Geschichte der Malerei* (1878).

Wolverene. See GLUTTON.

Wolverhampton, munic., parl., and co. bor., Staffordshire, England, 13 m. N.W. of Birmingham. The church of St. Peter is chiefly 13th-15th century, but of much older foundation. Public buildings include town hall, agricultural hall, municipal art gallery and museum, and technical schools and laboratories (chemical and metallurgical). The town is a great centre of the iron industry; motor cars and cycles jappanned and tin wares are also made. The manufacture of electrical machinery and plant is an important industry. Coal and iron are mined. Pop. munic. bor. (1901) 94,187.

Womb. See UTERUS.

Wombat (*Phascogomys*), a genus of herbivorous marsupials, with three living species, all confined to Australia and Tasmania. The largest species measure thirty inches from the tip of the snout to the root of the tail; and all have massive, clumsy bodies and short, thick legs. The head is broad and flat, the tail a mere stump, and there are five toes on each foot. With the exception of the first digit of the hind foot, all the toes are furnished with powerful claws, by means of which the animals are capable of excavating burrows. In these burrows or in rock-clefts the day is passed, while at night the animals roam about in search of grass, roots, and other kinds of vegetable food. All the teeth are rootless, and the incisors especially show a strong resemblance to those of ro-

dents. The common wombat, the largest species, is *P. Mitchelli*, and is confined to the Australian continent, while *P. ursinus* occurs in Tasmania and the neighbouring islands. The third species, *P. latifrons*, is South Australian.



Wombat.

Women. Biological Aspect.—The greater energy of the male, and the structural characteristics which render maternity so much more serious a function than paternity, constitute the most decisive factor in determining the position of women. A further biological fact of the first importance is the nature of hereditary transmission. The non-sexual characters and aptitudes of both parents are equally liable to be transmitted to the children of either sex, however modified their subsequent development may be by the presence of the sexual characters. If, therefore, one sex reveals many defective and incapacitating qualities, it is necessary to admit the possibility of their presence also in the other sex, which may equally inherit them; while, if one sex displays a marked superiority, that superiority is necessarily also transmissible to the other sex. From the biological standpoint, therefore, men and women are alike members of the same species, and must stand or fall together.

Position of Women in Savagery.—It used to be commonly believed that the position of women among most savage races is one of extreme and unmitigated oppression, and that they are constantly subjected to cruelty and violence by men. Such a view was emphasized by Letourneau, and traces of it may be found in many other writers. The more precise investigations of recent anthropologists have shown that this belief is, in the main, unfounded. It is quite true that under savage conditions the work of women is very frequently heavy and constant. But this is due not to the cruelty or oppression of the male sex, but to the natural biological fact that, owing to the maternal functions of women, the duties of civilization under primitive conditions inevitably press more urgently on women

than on men. Women must work more because at the period when labour has not become specialized women are practically the leaders of civilization.

We may probably see a fairly typical, though not specially favourable, example of the position of women among savages in the Papuans. Among them the husband had complete control over his wife: she was his property, for he had paid for her; under some circumstances he might even kill her. But although the position of women was here, we may say legally, so inferior to that of the men, their actual position was not unfavourable. They 'had a good deal to say on most questions,' Haddon remarks, 'and were by no means downtrodden or ill-used.' Moreover, they invariably took the initiative in courtship, and a man could not obtain a wife unless a woman made him an offer of marriage. (A number of facts bearing on the condition of women among the various primitive peoples of the world are brought together in the second volume of Ploss's work *Das Weib*.)

One source of the belief in the cruelty exercised by men towards women among primitive peoples is undoubtedly the misinterpretation of certain courtship customs which are of world-wide extension—e.g. the belief that 'marriage by capture' was formerly universal. The majority of these customs, however, appear to indicate neither the reality nor even the modified survival of such marriage, but, as Crawley has especially insisted, they may be best accounted for on psychological as well as ritual grounds. They are conventional ceremonies of courtship, in which both parties are consciously playing a well-defined part, in order to attain an end which both desire, and from which it is quite easy for the woman to be released should she so wish. It would even appear that, so far from involving any real violence, these customs may even have in part arisen as a concession to female modesty—an accepted convention by which the bride is spared from appearing in the public eye as too eager in seeking conjugal relationships. It is no longer permissible to regard so-called 'marriage by capture' as an indication of the social inferiority or subjection of women.

The Matriarchate.—Another stream of opinion has gone to the opposite extreme by setting up the theory of a primitive supremacy of women. In 1861 Bachofen published his book *Das Mutterrecht*, in which the arguments for this primitive gynococracy and matriarchate were first set forth,

and he was followed by M'Lennan and other investigators. These arguments rest on the belief that in emerging from a supposed early state of promiscuity the fact of maternity must be recognized earlier than that of paternity, as well as the undoubted fact that among some primitive peoples descent in the female line has clearly prevailed. It must, however, be borne in mind that we have no authenticated direct picture of any community, ancient or modern, in which this gynocracy has clearly or definitely prevailed. Moreover, descent in the female line, where it prevails, although it undoubtedly tends to give women a position of consideration, by no means necessarily confers any position of superiority. Matrarchy is not strictly analogous to the patriarchal constitution of a community; and while it has possibly influenced the position of women, and given rise to many isolated examples of feminine authority and influence, it is very doubtful whether it has ever prevailed as a definite and consistent system.

When the peoples of the West first appear before us in early historical times, the constitution of society is nearly everywhere mainly patriarchal. Fustel de Coulanges, in *La Cité Antique* (16th ed. 1898), has painted a clear picture of this state of things as it existed in early Greece and Rome. With the development of civilization the supreme authority of the *paterfamilias* became practically restricted; but in more subtle ways it received sanction in law, and with constant limiting modifications this legal tendency has been maintained in Europe to the present time.

The Influence of Christianity.—According to some, Christianity has raised the position of women; according to others, it has degraded it. In reality Christianity has in this matter exerted an influence in two opposing directions. As the religion of the oppressed, the gospel of suffering and pity, Christianity specially appealed to women, and sanctified some of the most typically feminine emotions. But, on the other hand, as a religion which at an early period of its history became strongly infused with ascetic ideals, Christianity was actively hostile to women, since it regarded them as the peculiar representatives of sexuality. Christianity glorified woman the virgin, and was practically lenient to woman the sinner; but although it opened careers for women in its cloisters, still, under the influence of the Pauline writings, it refused to them any open and conspicu-

ous part in the conduct of public worship. While, therefore, Christianity has offered many advantages to women, these advantages have always been strictly limited and partial. The religions of classic antiquity had at many points given to women a position of more unqualified honour, while the general position of women was never lower than in the late middle ages, when the influence of Christianity was supreme.

The Renaissance.—The renaissance, which served to liberate, or at all events to impart dignity to, so many of the human activities which Christianity had thrust into the background, ignored the pale and youthful virgin, and occupied itself with the mature and robust woman. As against the somewhat narrow and ascetic Christian ideal of woman, it set up a more broadly human ideal, which was first minutely described in literature by Boccaccio, and, after a considerable interval, first represented on canvas by Titian. The renaissance was much occupied with questions of beauty, and it fully recognized, sometimes even accentuating, the sexuality of women, while at the same time encouraging them in a devotion to intellectual pursuits.

Rise of Modern Movements of Emancipation.—It was in 17th-century France that the seeds of the modern growths of women's influence may be said to have been sown. At that time women began to assert themselves very prominently and independently in literature, setting forth various characteristically feminine ideas which were then new in the world, and at the same time beginning to assert a deliberate and conscious social influence on language and manners which was also new. By the early years of the 18th century this influence had become clearly affirmed, and in many respects recognized and accepted by men; it is noteworthy that men began to write, not merely for women, but in the manner of women, as in Marivaux's *Marianne*. At this period the growing influence of women showed itself in two parallel lines. Along one line women had acquired an unquestioned social supremacy; along another line the growth of more or less scientific social speculation had led to the development of what were subsequently called 'women's rights,' although it was not till later that these began to take practical shape. The Vicomte de Ségur, in a work on women which embodies the 18th-century French conceptions (though not published till the early part of the 19th century), writes from a standpoint which is exactly that of to-day. The finer

ideals of the century were, however, becoming coarsened some time before the revolution broke out, and the centre of the movements for raising the position of women was transferred to England. The transition was marked by the publication in 1792 of Mary Wollstonecraft's *Vindication of the Rights of Women*, a work which in its inspiration was largely French, but in its tone and tendency thoroughly English. From that time onwards England, and a little later America, have taken the foremost place in all movements for rendering the position of women as nearly as possible one of social equality with that of men. But such a movement is in any case inevitable with the development of civilization. The ancient and matured civilization of the Egyptians was very favourable to women, and the shorter but more rapid development of Rome constantly tended to improve their position. In the same way the legal enactments and decisions which have in England improved the condition of women began centuries before the existence of any propaganda for women's rights. The main tendency of civilization is in the direction of an ever greater freedom and scope for women.

At the present time, among all the peoples of European origin, there is a tendency to remove disabilities resting on a merely sexual basis, and to give to women the same rights and duties as men possess. An increasingly large body of people are reaching the belief that, whatever the special aptitudes of one sex or the other sex, it is unreasonable to put legal restrictions upon the exercise of what are, after all, simply human psychic activities, which are no more the attributes of one sex than are the more elementary physiological activities of walking or eating. Moreover, it is practically found that the movements of reform in this direction fail to yield the evil results which were formerly anticipated. The International Congress of Women held at Berlin in 1904 showed clearly, even in a country which has been by no means sympathetic to movements for enlarging the sphere of women, that women can meet together to discuss the great questions of social life in a wise and practical manner that gains the respect of men and deprives women of no desirable feminine characteristics.

Education.—In classic times women's education was mainly domestic, only the courtesan being highly trained, and the Spartans alone exercised in gymnastics. Christian monasticism enlarged the feminine world, and

even brought women into closer contact with men and with foreign countries; it was therefore an advance in education when the convents became the chief school for girls. Humanism and the classic renaissance stimulated the production of learned women in new branches of culture, and even produced women professors (notably at Bologna), but fostered no real growth in feminine education. In England Protestantism led to a new development of educational opportunities for boys, but to no new similar opportunities for girls; and even at the present day the secondary education of girls is in a very chaotic state, in marked contrast to both Germany and France. Universities are still widely regarded as masculine preserves into which women may only be admitted, on sufferance, a little way; and the girls' public day schools, the best type of girls' secondary schools in England, were not established until 1872. In America, with some exceptions, all teaching institutions—primary, secondary, and high—are co-educational. There has been much discussion concerning the advantages of the co-education of the sexes. In rural primary schools it is frequently a necessity; for all classes of schools its moral tendency is generally recognized as good on both boys and girls; in higher education it ensures that women shall have the best available training. At the same time, a rigidly complete co-educational system scarcely seems altogether to the advantage of women. It means that they shall receive a kind of education which has been built up exclusively to meet masculine requirements. The ideal education for girls would seem to be a loose co-education, with some degree of adaptation to the special needs of woman's organization and the special conditions of the average woman's life.

The successive steps in the development of the higher education of women in Britain are shown in the following *résumé*:—In 1833 the Birkbeck Literary and Scientific Institution opened its classes to women, and Queen's College was started in Harley Street, London, for an improved system of female education (1848). These were followed by Bedford College in 1849, the Yorkshire Ladies' Council of Education in 1865, and by the Ladies' Educational Society in Liverpool in 1866. Then came, in 1869, Girton College at Cambridge (beginning at Hitchin), and Newnham College in the same city in 1875. At Oxford Somerville Hall and Lady Margaret Hall were both formed in 1879, and in 1886 St. Hugh's

Hall was inaugurated with a system of cheaper fees. Although they can participate in the university examinations for degrees, women have not yet been admitted to graduation by Oxford and Cambridge. For degrees there are other universities open to them, however, among them those of London, Wales, Durham, Manchester, Liverpool, Leeds, Birmingham, Sheffield, Dublin (since 1904), and the four universities in Scotland. The principal colleges for women, in addition to those mentioned, are Westfield College at Hampstead (1882), Royal Holloway College (1887), St. George's Training College in Edinburgh, and St. Margaret's College in Glasgow (1893).

Edinburgh University has the credit of first opening its doors to women as students of medicine in 1869; then followed the foundation of the London School of Medicine for Women (1874). When the conjoint Colleges of Physicians and Surgeons of Edinburgh and Glasgow agreed to admit women to their diplomas (1886), the Edinburgh School of Medicine for Women was founded. In 1894 Edinburgh University recognized the classes of both of these institutions as qualifying for its examinations and degrees without admitting, as in the faculty of arts, women to the medical classes in the university. See *Education of Girls and Women in Great Britain*, by C. S. Bremner (1897), an admirable work.

Present Position of Women.—Some professions, such as that of law, are still nearly everywhere closed to women; in many respects, as in matters pertaining to divorce, women are on a different footing from men; and in very few states are women yet allowed to have any voice in the making of the laws which they are compelled to obey. It is possible that some of the legal disabilities of women are founded on a comparative natural disability, and that the law has merely enforced and generalized the existing natural tendencies. If that is so, there need be the less hesitation in removing such restrictions; while the advantage is gained that a minority are, by the removal of such restrictions, enabled to exercise the unusual aptitudes with which they are endowed. Some years ago the various governments of Europe showed great eagerness in enlisting women in their postal and telegraph services; female labour was more docile, and it was apparently cheaper. But experience demonstrated that the docility was counterbalanced by a lack of adaptability and of staying power, and the cheapness by a lack of resourcefulness and

initiative; so that at the present time, as Garland's inquiries have shown (*Economic Journal*, June 1901), most of the European administrations of the Postal Union are very discriminating in the employment of women telegraphists, and some have ceased to admit them altogether. The fears or the hopes of those who anticipated that women would oust men from what had previously been regarded as peculiarly masculine avocations are altogether groundless. The work of the sexes, wherever it can be compared, shows different characteristics, and there is ample room for each sex to display its special qualities. It is probable that the leaders in women's movements have in the past been mistaken in seeking to direct women too exclusively in the lines of men's activities, and in holding up masculine ideals for women to imitate. As Stanley Hall points out, the women of the future will treat as a matter for glory rather than for shame those characteristics of their constitution which lead up to maternity, at once the greatest function of the species and the special function of women. See Otis Mason's *Woman's Share in Primitive Culture* (1894); T. Wright's *Womankind in Western Europe* (1869); L. Eckenstein's *Woman under Monasticism* (1896); G. Stanley Hall's *Adolescence* (1904); Havelock Ellis's *Man and Woman* (4th ed. 1904); Theodore Stanton's *The Woman Question in Europe* (1884); Mrs. Ogilvie Gordon's *The International Council of Women* (1904). See also MARRIAGE.

Women's Clubs. These institutions are now numerous. In London there are the Beechwood, the Crystal Palace, the Empress, the New County, the Green Park (open to those 'eligible for court presentation'), the Hope (for 'business women'), the Ladies' Imperial, the Ladies' Athenæum, the Ladies' Army and Navy, the Ladies' Automobile, the Ladies' Empire, the Ladies' Town and Country, the New Era, the Portman, and the Shuttleworth. Several of the men's clubs admit ladies as visitors, and a few of the ladies' clubs admit men as guests. Among the leading ladies' clubs in London are the University, 32 George Street (500 members; entrance fee, one guinea; subscription, one guinea); the Writers', 10 Norfolk Street (350 members; entrance fee, one guinea; subscription, £1, 11s. 6d. and a guinea respectively for town and country members); and the Pioneer (temperance), in Grafton Street (650 members; entrance fee, three and two guineas, and subscription the

same, for town and country members respectively).

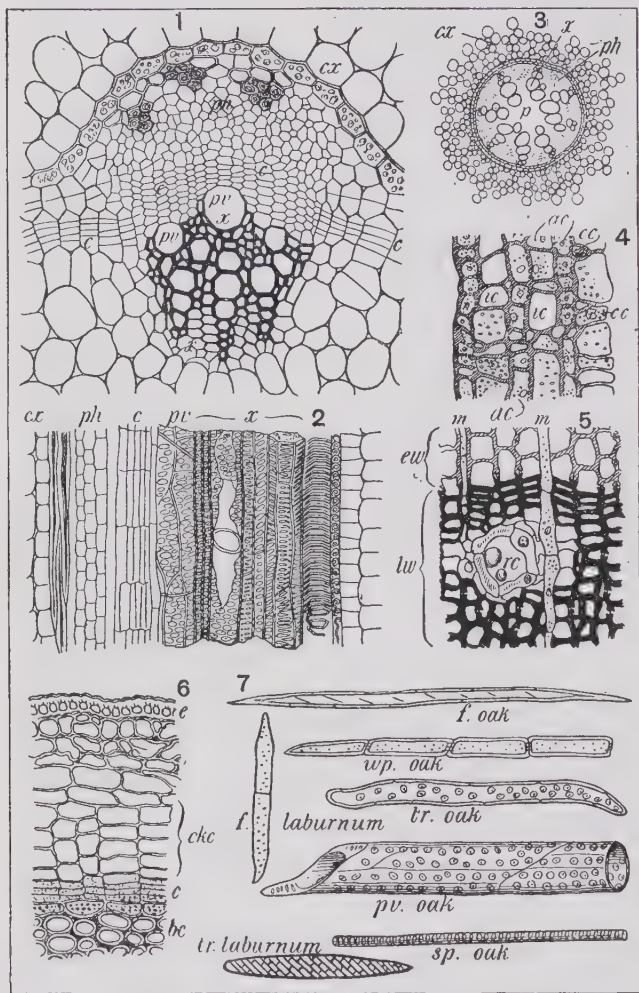
Women's Suffrage. The agitation on this subject may be considered to date from 1832, when, by the Reform Bill, women were disfranchised by the inser-

jected or withdrawn. Many of the colonies enjoy the privilege of female suffrage—among them New Zealand, Victoria, South Australia, and West Australia; while it was granted in 1902 to the women of the commonwealth

principal elections, if they are rate-payers. Recent demands for women's suffrage have ended in disaster, especially in June 1906, when four women were ejected for disorderly conduct from an Asquith meeting in Northampton, and were afterwards arrested for a demonstration at Mr. Asquith's house in London in the same month, one of them being imprisoned on refusal to pay a fine of £10. In July 1906 the women graduates of Edinburgh University also failed to get their claims to the franchise admitted by the Court of Session. The Society for Women's Suffrage has its central office at 28 Millbank Street, Westminster, S.W., with Miss Edith Palliser as secretary. See Mary Wollstonecraft's *Vindication of the Rights of Women* (new ed. 1891); J. S. Mill's *The Subjection of Women* (new ed. 1906); *History of Woman Suffrage*, by Stanton, Anthony, and Gage (3 vols. 1881-7); and Helen Blackburn's *Women's Suffrage* (1902), containing a full bibliography of the subject.

Wōn-san (Jap. *Gensan*; Chin. *Yuan-shan*), treaty port in Broughton Bay, on E. coast of Korea; has Japanese settlement of over 1,500 people; exports gold, fish, and hides.

Wood, in popular language, is practically synonymous with timber; botanically, the term is used interchangeably with xylem. In the first sense wood is found only in trees; in these xylem, foreshadowed in the axial strand of mosses, and clearly recognizable in the ferns, attains its full development. Only stems and large branches furnish wood, in the popular sense; technically, the wood is continuous, extending into the twigs and leaves. The constituents of wood are to be found in the fibro-vascular bundles that form, so to speak, the circulatory system of the plant, whether in a fern or a forest-tree. These bundles are made up of xylem, or wood elements, conveying the water, laden with earthy salts, and absorbed by the roots, to the leaves for elaboration; and phloem, or bast elements, by which the elaborated sap is returned to nourish the growing parts. Till they reach the stem, these wood elements are on the upper side. Consequently their bending round, when passing from a branch into the stem, brings them towards the centre. For the same reason the bast elements, till then underlying the wood, will be turned towards the outside. The essential tissue of the xylem, or wood, is called 'tracheal,' because it consists of wood-vessels (technically *vasa* or *tracheæ*), arising from the fusion of a longitudinal row



Wood—Diagrams of Structure.

1. Transverse section of part of stem of castor oil plant. 2. Longitudinal section. 3. Transverse section of root of sweet flag. 4. Pith cells of alder. 5. Transverse section of pine at junction of two annual rings. 6. Transverse section of outer part of stem of black currant. 7. Various wood elements. *px*, pitted vessel; *ph*, phloem; *x*, xylem; *c*, cambium; *cx*, cortex; *p*, pith (medulla); *ac*, active cells; *ic*, inactive cells; *cc*, crystal cells; *ew*, early wood; *lw*, late wood; *m*, medullary rays; *rc*, resin canal; *e*, epidermis; *ckc*, cork cells; *bc*, bast cells; *f*, fibre; *wp*, wood parenchyma cells; *tr*, tracheid; *sp*, spiral vessel.

tion of the word 'male' before the word 'person.' Female suffrage was decided to be illegal by the Court of Common Pleas in 1868. On many occasions 'Women's Disabilities Removal bills have been introduced, but have been invariably either re-

jected or withdrawn. Many of the colonies enjoy the privilege of female suffrage—among them New Zealand, Victoria, South Australia, and West Australia; while it was granted in 1902 to the women of the commonwealth

of cells, and tracheids, developed from a single cell. In both cases the cell protoplasm has disappeared, and the walls have become thickened by the deposition of lignin, to which substance (probably a modification of cellulose) the hardness of wood is due.

In the first year's growth these bundles are arranged round the central pith, at some distance from each other. With the second year's growth the cambium ring is formed, stretching from bundle to bundle. New cells are given off from this ring, both internally and externally. The former are modified into wood elements, and the latter into bast elements, so that in each successive year the cambium ring is carried farther and farther from the centre, near which is the oldest wood, while the oldest bast is at the circumference. There is a marked difference between the wood formed in the spring and that of the autumn growth. In the former the walls of the vessels are thin, and consequently the passage is large; in the latter the lignification of the walls diminishes the size of the passage. Of course the autumn wood, with its closer grain, bounds the rings of any given year. These annual rings are used to ascertain the age of a stem. Duramen, or heart wood, is the name given to the dark central portion of the stem of old trees; the outer portion, by which the watery solutions absorbed by the roots are carried up to the leaves, is the alburnum, or sapwood. Till a tree attains maturity, the annual rings increase in breadth; there is then a stationary period, followed by a decline in the quantity of woody material laid down. Rarely, however, is the breadth of a given ring uniform, especially when trees are crowded together. The pale lines running from the centre to the circumference are the medullary rays, which convey elaborated sap to the inner part of the stem and store up reserve food. They consist of elongated cells in rows, varying in width and depth, but are not vertically continuous. In recent years the uses of wood have been multiplied. It is greatly used for the manufacture of the cheaper kinds of paper; from wood threads are spun (Kellner-Türk process), and from the yarn, known as licella, a good serviceable cloth, used in place of jute or cotton cloth, has been produced. Among other flourishing industries are the manufacture from wood fibre of artificial silk, artificial hair, straw for the manufacture of hats, and the distillation of wood for the production of sugar and alcohol. See H. M. Ward's *The Oak* (1892)

and *Timber and Timber Trees* (1894), and Strasburger's *Text-book of Botany* (1903).

Wood, SIR ANDREW (d. 1515), Scottish admiral, was a native of the old Kirkton of Largo, Fifeshire. Originally a merchant trader, he showed great skill and enterprise in defending himself against English, French, and Portuguese pirates. For his services to James III. he obtained, in 1483, a charter of the lands and village of Largo, and received knighthood. Wood was employed on various expeditions by James IV. He must be distinguished from his eldest son of the same name.

Wood, or A WOOD, ANTHONY (1632-95), English antiquary and biographer, was born at Oxford. He is the author of the *History and Antiquities of Oxford*, published in Latin (1674), the English edition appearing in 1786-96. Wood's *Athenæ Oxonienses*, a personal history of distinguished Oxonians between 1500 and 1690, appeared in 1691-2. This last work was construed into an attack upon Lord Clarendon, and Wood was expelled from the university. He was, however, at length permitted to return to Oxford. A third volume of the *Athenæ Oxonienses* was printed in 1721. Wood also wrote *The Ancient and Present State of the City of Oxford* (1773), and *A Survey of the Antiquities of the City of Oxford*, ed. by A. Clark (1895). His *Autobiography* was edited in 1892 by Clark, who further wrote *The Life and Times of A. Wood* (4 vols. 1895).

Wood, ELLEN, better known as MRS. HENRY WOOD (1814-87), English novelist, was born in Worcester. In 1836 she married Henry Wood, of the consular service, and spent the next twenty years abroad. Shortly after her return to England she began to publish novels, which won her instant popularity. *Danesbury House* (1860) was the first, and *East Lynne* followed in 1861. *Mrs. Halliburton's Troubles* (1862) and *The Channings* (1862) were less melodramatic, but no less popular, than *East Lynne*. In 1867 she founded the *Argosy*, a magazine in which her work subsequently appeared—the 'Johnny Ludlow' tales (1874-1880) being her best literary work.

Wood, SIR EVELYN (1838), British general, was born near Brintree, Essex. In 1854 he served with the Naval Brigade in the Crimea, and was severely wounded at Sebastopol. Exchanging into the army, he served throughout the Indian mutiny (1858). Six months afterwards, while still employed in hunting down rebels in the jungles, he won (1858) the Victoria Cross. Wood's next em-

ployment was in the Ashanti war (1873-4). After the Gaika (Kaffir) war (1878) he raised a force known as 'Wood's Irregulars,' consisting of 1,000 friendly Zulus. Two days after the British reverse at Isandlwana he surprised and defeated a large force of the enemy, inflicted further loss upon them at Kambula (March 29), and took part in the battle of Ulundi (July 4). His services were rewarded with a K.C.B. (1879). During the Boer war (1881) Wood, on the death of Sir G. Colley at Majuba (February 27), assumed the command of the British forces. During the next three years (1882-5) he was engaged in Egypt, where, as sirdar (1883-85), he began the reorganization and training of the native army.



Sir Evelyn Wood.
(Photo by Russell & Sons.)

He was adjutant-general to the forces (1897-1901), and in 1903 was created a field-marshal. Since 1901 he has commanded the 2nd Army Corps. He has written *The Crimea in 1854-94*, *Cavalry at Waterloo*, and *Achievements of Cavalry*.

Wood, JOHN GEORGE (1827-89), popular writer on natural history, was born in London; worked for some time in the anatomical museum at Oxford. His first book, like his last, was an *Illustrated Natural History* (1851), and between that and his death he produced no fewer than fifty-nine works. He was not a scientist, but a popularizer, and he was thoroughly successful in making natural history interesting. See *Life* by his son (1890).

Wood, WILLIAM (1671-1730), English ironmaster, was born at Wolverhampton; was among the first to use pit coal in the manu-

facture of iron. It was to him that the patent was issued to coin halfpence and farthings for Ireland (1722). Though the coins were better than Ireland had, they were much poorer in quality than the corresponding English coins. Dean Swift's *Drapier Letters* brought down the storm the Irish Parliament invoked, and the patent had to be surrendered (1725). Wood receiving a pension of £3,000 in compensation.

Woodbine, a name used by Shakespeare to refer to the honey-suckle, though Milton used it much more loosely. In earlier times it was applied to most twining or climbing plants.

Woodbridge, mkt. tn. and port, Suffolk, England, 8 m. E.N.E. of Ipswich. St. Mary's church has 14th-century tower. Pop. (1901) 4,640.

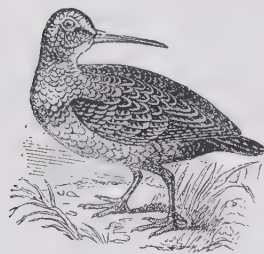
Woodbury, WALTER BENTLEY (1834-85), English inventor, was born in Manchester. In 1852 he joined the rush to the Australian goldfields. He returned to England in 1863, and began making experiments in photography with a view to photographic engraving. In 1866 he patented the process called by his name, which formed the foundation of the more modern photographic process.

Woodburytype. See PROCESS WORK.

Wood-carving. See CARVING.

Woodchat. See SHRIKE.

Woodchuck. See MARMOTS.



Woodcock.

Woodcock (*Scolopax rusticula*), a bird belonging to the sub-family Scolopacinae, and closely related to the snipe. It occurs as a breeding species in Britain, as well as throughout northern and central Europe and Asia, and is also found abundantly in the British area as an autumn migrant. The woodcock reaches a length of over fourteen inches, and is greatly prized for the table. The colouring is a combination of brown, gray, and buff, with black markings, and there are two transverse buff stripes at the back of the head. The birds frequent woods, especially marshy woods, and feed upon worms, insects, and molluscs.

During the breeding season the cocks have a habit of following certain tracks in the woods—called the 'cock roads'—and while traversing these they utter whistling notes. The nest is a depression lined with dry leaves, in which four eggs are laid. The young are often carried about by the parents between the thighs. In the eastern part of N. America the British woodcock is represented by *Philohela minor*, a smaller form. See Shaw's *Woodcock and Snipe* (1904).

Wood-engraving is exactly the reverse of steel-engraving, where the parts to be printed are cut out and the ink rubbed into the lines thus made. In a wood engraving the parts to appear white are cut away, and those to be printed are left untouched. Several kinds of wood have been used, but by far the most suitable is box. Boxwood being seldom obtainable of sufficiently uniform texture for engraving purposes over about four inches' diameter, blocks of larger size than this are built up. This is done by a method of mortising, deep grooves being cut in the side of each piece and a slip of hard wood inserted. Great care has to be taken that all edges and surfaces are planed dead true. The engraving is done, not on the side, but on the end of the wood. The boxwood block, when built up, has a surface much too smooth to draw upon. It has therefore to be prepared for this or 'grounded.' This is done by rubbing a little water-colour white evenly over its surface with the ball of the thumb, and when this is dry it can be freely worked upon with either pencil or brush. Sometimes the drawing to be engraved is made directly upon the block, every line exactly as it is to appear when printed, but, of course, the reverse way; sometimes a tracing is made of the original, reversed down, and then worked up in black line facsimile. When this is finished, the block is covered with paper to keep the design or picture from injury.

For the actual engraving three kinds of cutting tools are used, each in several degrees of fineness—gravers, tint tools, and scorpers or gouges. Some engravers use tools having slightly convex cutting edges, and known as 'spit stickers.' When he starts work upon a new block, the first thing the engraver does is to remove a small portion of the protecting paper from its face. On the part of the design thus exposed he makes with his graver a cut on each side of every drawn line. This stage is called 'outlining,' and the operation is repeated section by section till the whole block is treated:

then, if the subject be a line drawing, the scorpers are used to cut away the parts which should appear white on the print. This done, the block is ready for proving. To prove a block, the ink is dabbed lightly and evenly over its surface by a silk 'dabber,' a piece of India paper placed gently upon it, and rubbed firmly with the burnisher over the work: between the burnisher and the India paper a card should be placed to take the friction.

To engrave a wash drawing, the procedure is slightly different. The picture is outlined where the outlining is needed, as before; but as each section is outlined, the protecting paper is replaced over it. When the outlining is completed, the block is again gone over section by section, this time with the tint tool; and it is his manipulation of the tint tool which brings out the best skill of the engraver. By it he has so to line the block that flat washes will appear when printed as they do on his copy, and not as simply a number of lines; by it, too, he gives the texture of sky, clouds, foliage, grass, sea, or whatever else his subject requires. When all is done, the whites are removed with the scoper, and the block is proved as in the case of the line drawing. Should an alteration be necessary, a hole is drilled about two-thirds through the block; into this hole a tightly-fitting boxwood plug is driven, cut off, planed flush, and the new engraving executed upon it.

In the last quarter of the 19th century improvements in printing machinery and in photography powerfully affected the art of wood-engraving. The former rendered possible the adequate reproduction of very finely engraved cuts; the latter, by enabling subjects to be photographed direct upon the wood, dispensed with the laborious process of drawing. The photographer, by means of the half-tone process, has contrived to dispense with engraving altogether; so that, although letterpress illustration was never more abundant than it is now, very little of it is engraved on wood. Illustrations which, even when done in sections, would have required days to engrave on wood, are produced in a few hours by process. The half-tone block, when well printed, gives a very soft effect, but lacks texture and vigour, and in many cases, where the best results are required, engraved upon; so that although pure wood-engraving is fast disappearing before the process block, there is still a field for the artistic wood engraver in rendering his triumphant rival a worthy successor. See P. Kristeller's

Kupferstich und Holzschnitt in vier Jahrhunderten (1905), and other works mentioned under ENGRAVING.

Woodgate, Sir Edward
ROBERT (1845-1900), British

Kumassi. In the Zulu war (1879) he distinguished himself at Kambula and Ulundi, while in 1899 he commanded the Lancashire brigade in S. Africa, crossing the Tugela with Warren in December.

Horncastle. Its mineral spring (discovered 1811) is efficacious in rheumatic, neuralgic, cutaneous, and other maladies. Pop. (1901) 988.

Woodhouselee. See TYTLER.

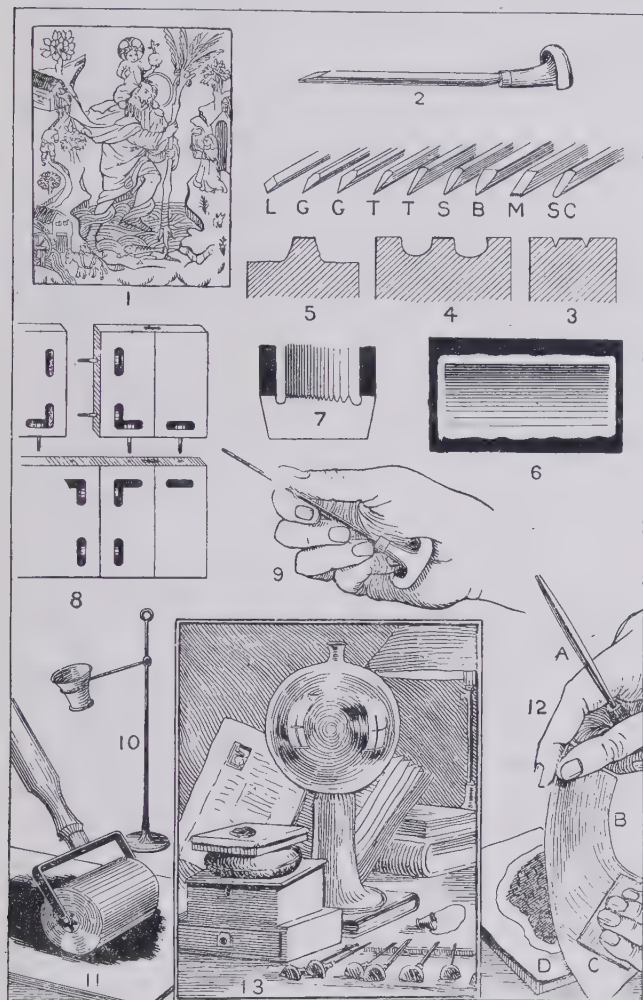
Wood-ibis. See TANTALUS.

Wood-lice (Oniscidea), a group of isopod Crustacea, whose members are adapted for a terrestrial life. The body is usually oval, convex above and concave or flat below; the head is small; the thorax consists of seven segments, each of which bears a pair of walking limbs; the abdomen is short, and its appendages are converted into breathing organs. The wood-lice inhabit damp places, are usually nocturnal, and are vegetarian in diet. Very common in gardens and hothouses are the so-called 'slaters,' the two most frequent forms being *Oniscus asellus* and *Porcellio scaber*; the former has a smooth and the latter a tuberculated coat. The pill-wood-louse (*Armadillidium vulgare*), which is capable of rolling itself into a ball, formerly enjoyed a great reputation in medicine, being taken in the rolled-up condition as a pill. On the seashore, among stones, the large *Ligia oceanica*, which attains a length of more than an inch, is common.

Wood Naphtha. See PYROXYLIC.

Wood Oil. See GURJUN BALSAM.

Woodpecker, a general name for the members of the large family Picidae, which is usually regarded as including two sub-families—the woodpeckers proper and the soft-tailed wrynecks. The woodpeckers are climbing birds, the feet having two anterior and two posterior toes. The head is large, the neck very muscular, and the tongue exceedingly long and worm-like, with a barbed and horny tip. It can be shot out to a great distance, and is sticky, so that the insects upon which the birds feed stick to it. All woodpeckers are shy, solitary birds, inhabiting woods. When in search of food they climb trees in a spiral fashion, clinging closely with the claws, assisted by the tail. At the breeding season the woodpecker excavates a hole in the stem of a tree, at first horizontal, then downward to the depth of a foot or more. At the bottom of the excavation the pure white eggs are laid. Certain of the woodpeckers, notably the spotted forms, produce in spring a curious drumming noise, apparently made by the bill hammering on the bark of a branch. Three species of woodpecker occur in Britain, but none can be said to be common. The green woodpecker (*Geococcyx viridis*) is the



Wood-engraving Tools and Processes.

1. Oldest known wood-cut, found in the Charteuse of Buxheim, dated 1423. 2. Side view of wood-engraving tool: 1, front view of lozenge tool; 6, gravers; 7, tint tools; 8, spit stickler; 9, bull sticker; m, multiple tool; sc, scooper. 3. Section, showing pencil line on wood block outlined with tint tool (much magnified). 4. The same, scooped on either side. 5. The same, with a single cut. 6. The same, with a double cut. 7. The same, with a triple cut. 8. A section, showing depth of cuts. 8. Amalgamated block, showing system of bolting up. 9. View of bottom of tool, showing method of holding same. 10. Stand with eyeglass. 11. Roller and ink slab. 12. Proving, lifting paper to note progress: A, brushster; B, India paper; c, piece of card to hold paper steady; d, glass plate; e, india paper; f, blotting paper; g, sheet of paper. 13. Pressing out sand; back: behind is glass globe filled with water for concentrating artificial light rays.

major-general. Serving in the Abyssinian campaign (1868), he was present at the capture of Magdala. He was also actively engaged in the Ashanti war (1873-74), taking part in the capture of

and on January 23 occupying Spion Kop. On the following day he was severely wounded, and died on March 23.

Woodhall Spa, tn., Lincolnshire, England, 6½ m. s.w. of

largest species, reaching a length of twelve and a half inches. Its loud laughing cry is supposed to forecast rain, hence its name of rafterbird, which also receives the names of *raff* and *wood-hen*. The great spotted woodpecker (*Dendrocopos major*) occurs, though infrequently, throughout England, and in suitable localities in Scotland; while the smaller spotted form (*D. minor*) is confined to the south of England. The former is black and white, with a crimson nape; the latter, somewhat similar in colouring, has the back barred with white on a black ground. A large number of other woodpeckers are distributed throughout the world, except in the Australian region, Egypt, and Madagascar. Mention may be made of the tiny peewees (*Picumnus*) of S. America and the Orient, region.



Great Spotted Woodpecker.

Wood-preserving. See TIMBER.

Wood Pulp, a material largely employed for paper-making, and obtained by disintegrating wood. The wood fibres are separated either mechanically or chemically. The first variety is prepared by grinding the wood under water, and is of inferior quality, as the fibres are short and readily discolour. In the superior kinds, prepared by chemical means, the wood is cut up and boiled under pressure with solution of caustic soda, sodium sulphide, or, best of all, calcium bisulphite, and the resulting soft product is pulped, pressed, washed, and bleached. See PAPER.

Woodruff (*Asperula odorata*), a dainty little hardy plant belonging to the order Rubiaceae. It bears little white flowers in early summer, and its dried leaves

have a delicious hay-like scent, which persists for a long time. The woodruff or *Waldmeister* is used in Germany for the flavouring of May wine or *Maitrank*.

Woods, MARGARET LOUISA, nee BRADLEY (1836), English novelist and poet, was born at Rugby, and married Rev. Henry Woods in 1879. Her published novels are *A Village Tragedy* (1887); *Escher Vanhomrigh* (1891), a story dealing with the 'Stella' episode in Swift's life; *The Vagabonds* (1894), a clever study of circus folk's life; *Weeping Ferry* (1898); *Sons of the Seord* (1901); *The King's Revolve* (1905). Her poems are *Lyrics* (1888); *Lyrics and Ballads* (1889); *Aeronomy, and other Poems* (1896); *Wild Justice* (1896); *Songs*, privately printed (1896). Mrs. Woods has also published a historical drama, *The Princess of Hanover* (1902).

Woods and Forests. George III. surrendered the crown lands in the United Kingdom to the nation in return for a fixed civil list, and they are now regulated by two commissioners of woods, forests, and land revenues, under the supervision of the Treasury. The management of the crown foreshores was transferred to the Board of Trade in 1866. The commissioners have powers of leasing crown lands for ordinary purposes for thirty-one years, for mines for sixty-three years, and for building, gardens, etc., for ninety-nine years. They may sell or exchange any lands, etc., except royal forests, parks, or chases, and may enfranchise copyholds. It is their duty to obtain as large an income as they can from crown property, without allowing any part of the capital value to be sacrificed with that object. The crown has power to appoint a surveyor-general of woods, forests, and land revenues in place of the commissioners. The surplus income of the woods and forests, which amounted in March 1905 to £470,000, is handed over to the Exchequer.

Wood's Halfpence. See WOOD, WILLIAM; and SWIFT, JONATHAN.

Woodsia, a genus of small ferns, generally with densely-tufted fronds. *W. alpina* (or *W. hyperborea*) is a native of Britain, and it, as well as *W. obtusa*, *W. polystichoides*, and *W. caucasica*, are desirable cool-house or hardy species, whilst the Mexican *W. mollis* is a fine greenhouse fern.

Wood-sorrel. See SORREL.

Wood-spirit. See PYROXYLIC.

Woodstock, munic. bor., Oxfordshire, England, 8 m. N.E. of Witney. Manufactures gloves. Near the town is Blenheim Park (formerly Woodstock), granted by

Queen Anne to the Duke of Marlborough in commemoration of his great victory. Pop. (1901) 1,684.

Woodstock, tn., cap. of Oxford co., Ontario, Canada, on the Thames, 78 m. S.W. of Toronto; has manufactures of woollen goods. Butter and cheese are exported. Pop. (1901) 8,833.

Wood-swallow, a name given to the members of the passerine family Artamidae, which are Australian birds of doubtful position. In habits they show some resemblance to swallows, but are probably much more nearly related to the shrikes.

Woodville, RICHARD CATON (1856), English artist and painter of battle scenes. He was born in London, and received his early education at Düsseldorf in Germany. His practical knowledge of war subjects was gained in the Turkish war (1878) and the Egyptian war (1882). In 1879 he first exhibited at the Royal Academy, and executed several commissions for Queen Victoria. His best known pictures are *Death of General Sir Herbert Stewart*, and *The Guards at Tel-el-Kebir*.


Woodward, BENJAMIN (1815-61), Irish architect. With Sir Thomas Deane he designed Queen's College, Cork (1846-8); became partner with Sir Thomas and his son in Dublin (1853); and built Trinity College new library (1853-7). His greatest work, however, is the Oxford new museum, which he erected (1855-60) under the supervision of Ruskin.

Woodward, HENRY (1832), English palæontologist, keeper of the department of geology in the British Museum (1880-1901), was born at Norwich, and became an assistant in the British Museum (1858) under Sir Richard Owen and his brother, Dr. Woodward, Owen's principal assistant. He next joined Robert Macandrew (1860) on a dredging expedition to the south coast of Spain and the Mediterranean. For many years he has been the leading British authority on crustacea and mollusca. He has written monographs on the *Merostomata* (1866-78), and on *Carboniferous Trilobites* (1883-4).

Woodward, SAMUEL PICKWORTH (1821-65), English naturalist, was born at Norwich. In 1836 he was engaged as an assistant by Turner, the botanist; in 1838 he found employment in the British Museum, and later in the Geological Society. He became professor of geology at an agricultural college (1845), and returned to the British Museum in 1848 as a first-class assistant in the geological department. He became a great authority on invertebrate fossils, especially fossil mollusca. He published (1851-6) *Manual of the Mollusca*.

Woodwork. — *Artificial.* — About one-eighth of all the timber used is wasted as sawdust and shavings. Sawdust mixed with common glue forms what is called among carpenters 'boman-tigum,' and it makes a paste, which, if properly prepared, sets and can be carved like wood. Cocoa-nut shells powdered are also available, and may be treated in the same way. A tough, elastic, artificial wood is made by combining 'short fibre,' or bits of wood two inches long bruised into threads, with the paste made of finely-sifted sawdust. Artificial wood can be made waterproof by mixing it with a solution of potassium bichromate. Wood paste is very useful to fill up cracks or knot-holes in wood, and for all repairs; carvings can be perfectly restored with it, and very good furniture can be made with fibre-paste.

If we take wood shavings, the thinner the better, and use strong glass-paste, they will, when wet, bend like paper, and can be applied to any surface, like veneering. By pasting one layer of shaving on another, taking care to cross alternate layers, we can make boards which do not readily split or curve. Oil-glue should be used, and pressure employed during the process. Boats, masts, bows, or any articles requiring strength and flexibility, as also ornaments and musical instruments, can thus be made. See Leland's *Wood from Shavings* (1899), Hartleben's *Manual of Artificial Wood and Shavings* (1900), and Lambert's *Artificial Wood* (1900).

Decorative. — Ordinary woodwork can be decorated by a number of easy processes. The first of these is by cutting patterns with a gouge and indenting the ground, or by simple outlined and stamped work, the 'sunk cutting,' or intaglio being stained black or brown. Poker work by burning or pyrography may be applied to all kinds of woodwork; the same is perfectly imitated by painting with Vandyke brown. Venetian marquetry is executed by drawing patterns on wood with a penknife. The cut is filled with black wax, and the 'islands' of the pattern are separately stained, the whole being then varnished. Another method is to draw bold patterns on wood, of an old ivory or yellowish brown colour. Outline these with a small fluter gouge, and paint the hollows a dark brown, and varnish. Inlaying wood with silver or brass wire is very simple. A groove is cut or lined with a penknife, into which line the wire must fit exactly. Turn the two ends of the wire thus , lay it in the groove, and with a hammer drive

the ends in. Sheet metal in small pieces can also be hammered into wood. Inlaying of various kinds is largely applied to wood. Imitation metal inlay consists of gilding or of the application of bronze powders with size. See *Decorative Wood Work* (1901), by Leland and Dawson (Arts and Handicrafts Series).

Wool is the fibrous growth on the skin of various kinds of sheep, and differs from hair in being more elastic and having the scales that clothe the core of the fibres more projecting and more pointed; thus the fibres are capable of being felted together and spun into a firm thread. Wool has a specific gravity of 1.3, is not affected by weak acids, though readily acted on in alkalis, and is very similar in composition to horn. In its natural state wool is charged with about 40 per cent. of a grease called yolk or suint, largely composed of a complex alcohol, cholesterol. For textile purposes wool is chiefly obtained from S. America, Australia, New Zealand, S. Africa, and India; a comparatively small amount is produced in Great Britain or Europe, though that of certain localities has special applications, as in the case of the Silesian, Cheviot, and Southdown wools. For the processes of manufacture, see WOOLLEN TEXTILES.

Wool, or **WELD**, or **DYER'S WEED** (*Reseda luteola*), is a native British plant, bearing yellowish-green, mignonette-like flowers, and having a stem two or three feet in height. It was formerly, and still is occasionally, used for dyeing.

Woollahra, picturesque residential suburb 3 m. S.E. of Sydney, New South Wales, Australia. Pop. (1901) 12,358.

Woollen Textiles are conveniently classified as (1) fabrics produced on the woollen principle; (2) fabrics produced on the worsted principle; (3) fabrics usually classified under the name 'stuffs.' The difference between the woollen and worsted principles is mainly one of yarn (*i.e.* thread) construction, or arrangement of the fibres composing the threads. Leeds and district work principally upon the woollen principle, Huddersfield principally upon the worsted principle, and Bradford principally upon the stuffs principle. But Bradford produces also large quantities of worsted fabrics, as does Leeds; while Huddersfield, in part, employs the woollen principle, often producing cloths possessing both woollen and worsted characteristics. Originally the west of England and the Scottish trades were based upon the woollen principle, but in these districts to-day many varie-

ties of structure are produced. In France, Elbeuf takes the place of Huddersfield, and Roubaix the place of Bradford. Great Britain has a large trade in yarns.

In the woollen trade, as a rule, the manufacturer buys his own raw materials, spins his own yarn, and weaves it up into cloth, which he sells. But the woollen spinners of Belgium and the north of France spin only, and sell their yarn.

FABRICS PRODUCED ON THE WOOLLEN PRINCIPLE. — *Raw Materials.* — The materials employed consist of (1) wools, principally the shorter varieties. (2) Nod — *i.e.* the short fibres taken out of wools in the combing operation, the longer fibres being employed for worsted yarns. (3) Re-manufactured materials, principally mungo or shoddy. Mungo is produced by tearing up ordinary wool suitings; shoddy by tearing up fabrics composed of the longer wools. (4) Cotton or cotton sweepings, which, being usually of a fair length of staple, act as a kind of binding round which other material — say mungos — centre and form a compact thread. (5) Fud and flocks — the waste or 'fly' from the various machines employed in woollen and worsted manufacture.

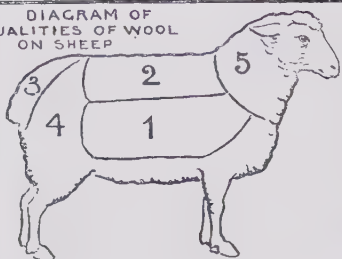
The cheap cloth trade of the Batley, Dewsbury, and Yeaden district of Yorkshire is based entirely upon the cheaper materials, while the Scottish and west of England tweed trades have been built upon the genuine article.

Processes of Yarn Construction.

— If the wool is received in the raw state, it must be scoured — *i.e.* thoroughly cleansed — and this is usually effected by passing it through three or four machines charged with soap and alkali and rinsing solutions, and finally passing it on to the dryer, which delivers it to the blender. Upon the blender's choice of materials for mixing depend both the quality and the price of the resultant yarn. Having selected his materials, he builds up a stack of these by placing a layer of one material, then a layer of another material, and so on. This stack is then beaten down with sticks, air blasts being sometimes applied to effect or assist in this operation. Willowing refers to the passing of the blend through a willow or spoked drum machine, while teasing refers in like manner to passing the blend through the teaser — a finer machine more nearly approaching the card, which mixes the fibres more finely. As a rule, the blend is then allowed to 'mellow' for a few days or weeks.

The operation of carding consists in thoroughly separating and mixing the individual fibres of

DIAGRAM OF QUALITIES OF WOOL ON SHEEP

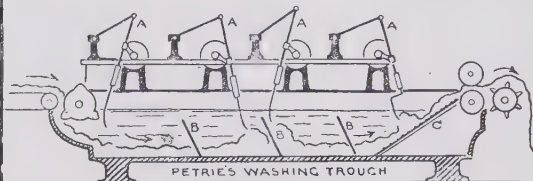


1 LONG & MOST EVEN. 2 COARSER & SHORTER
3 VERY COARSE. 4 STRONG & LONG
5 SHORT BUT FINE.

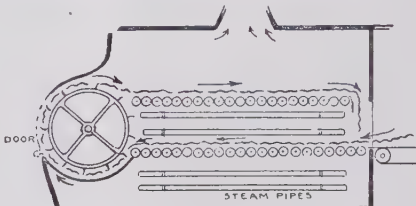
CHARACTER OF WOOL



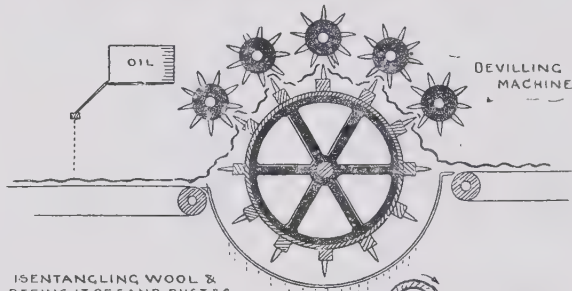
SECTION SHOWING SCALES INTERLOCKING



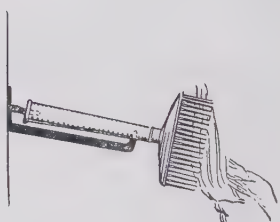
A MOVING RAKES B FIXED RAKES C LIFTER



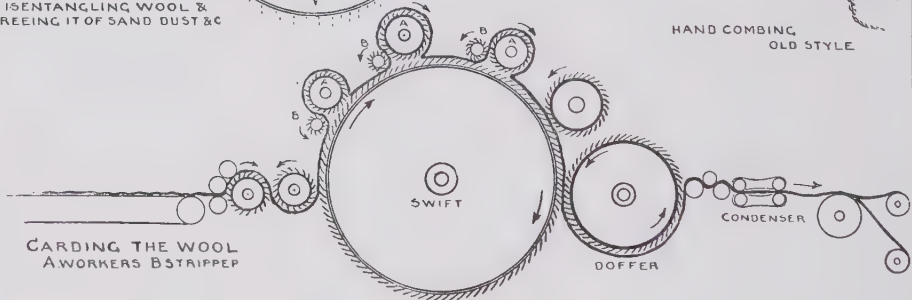
DRYING THE WOOL



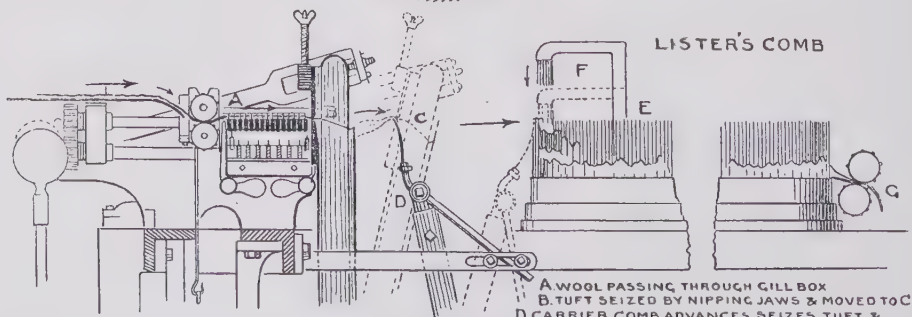
1. ENTANGLING WOOL & REEING IT OF SAND DUST & C



HAND COMBING OLD STYLE



CARDING THE WOOL
A WORKERS B STRIPPER



LISTER'S COMB

A WOOL PASSING THROUGH GILL BOX
B TUFT SEIZED BY NIPPING JAWS & MOVED TO C
D CARRIER COMB ADVANCES SEIZES TUFT & TRANSFERS IT TO ROTATING COMB E. PRESSED DOWN
BY BRUSH F. CONTINUOUS SLIVER DRAWN OFF AT G

which any blend is composed, the result being a uniform film or sliver of wool, from 60 to 80 in. wide, and say $\frac{1}{2}$ in. thick, which is broken up in the condenser into sixty or eighty slivers or pith-like filaments, which are eventually spun into threads on the mule. The carder itself consists of a number of cylinders clothed with 'card clothing,' which tease out the fibres and recombine them again to form a film, which is again teased out, and so on. The material as it comes from the teaser is fed on to a lattice at one end of the carder, and this gradually carries it within reach of the revolving cylinders, which alternately draft and condense it—*i.e.* draw it out into a thin film, and then add film to film until it is finally ready for the true condensing, which will split it up into pith-like filaments ready for the mule. The last cylinders, by a very simple arrangement, split the film up into, say, one-inch slivers, which are wound on spindles ready for being passed to the next operation.

The operation of 'mule spinning' is as follows:—First, the condensed sliver, as received from the carder, being too thick for thread, must be drawn out or drafted—*i.e.* say one yard drawn out to two yards (or a draft of two); secondly, to prevent the sliver from breaking, a little twist must be inserted during the drafting; thirdly, when drafting is accomplished, the necessary twist must be inserted; and finally, the spun yarn must be wound into the spindle. The mule effects all these processes as the carriage recedes or runs out. As the carriage runs in, the spindles not only wind up the yarn spun, but by means of the faller wire build it up into a firm 'cop,' from which the yarn can eventually be clearly drawn for warping or weaving.

Processes of Fabric Construction.—Upon receiving the yarn from the spinner, the manufacturer arranges the warp in the loom. The shuttle is arranged to take the spool, or cop, upon which the weft yarn is wound by the mule. The most recent important development in power-loom construction is the 'North-rope loom,' in which, when a cop has been emptied, an automatic motion forces out the empty spool and inserts a full spool, without stopping the loom.

The operations which the loom performs in producing a piece of cloth are as follows:—(1.) Shedding—*i.e.* dividing the warp into two parts, between which the shuttle can lay the weft, there being at each successive passage of the shuttle a change of the

threads raised and depressed. (2.) Picking—*i.e.* throwing the shuttle through the various sheds formed, a length of weft being left in each successive shed, and the cloth thus built up at the rate of say sixty picks per minute for heavy looms and fabrics, and say 150 picks per minute for light looms and fabrics. (3.) Beating-up—*i.e.* by what is termed the 'reed,' pressing or beating each successive pick or weft thread close to the previous pick, thus forming a firm texture. (4.) As the cloth is produced, it is wound on to the cloth beam; at the same time the warp is unwound from the warp beam, so that there is a constant succession of unwoven warp for the shuttle to work upon. These two operations are termed 'taking-up' and 'letting-off.'

Processes of Finishing.—When the woollen fabric leaves the loom, it is usually uncouth, harsh, and anything but inviting either in appearance or in feel. The following are the processes to which all typical woollen cloths are submitted in order that they may receive the requisite finishing:—(1.) Burling and mending, to correct weaving faults as far as possible. (2.) Scouring, to cleanse the fabric thoroughly. (3.) Mending, again to insure a perfect piece. (4.) Milling, either in the milling machine, or the stocks, or both, according to the finish required. (5.) Final scouring or washing off, to rid cloth of the milling agents, such as soap and fuller's earth. (6.) Tentering, crabbing, etc., to set the cloth at a satisfactory width and straighten it for the subsequent processes. (7.) Raising on the 'gig,' to produce the necessary pile or to assist in clearing the fabric of loose rough hairs. (8.) Cropping or cutting, to leave a fibre pile of a uniform height, or, if necessary, to cut off all raised fibres, thus leaving a clean face. (9.) Pressing, to secure the required gloss or handle according to requirements. To obtain lustre, crabbing, steaming, or boiling are employed.

FABRICS PRODUCED ON THE WORSTED PRINCIPLE.—The worsted trade of Britain, by its absolute bulk, and also by being mainly located in one district, has, quite unlike the woollen trade, split up into several sections—*e.g.* the wool trade; the preparing and combing trade; the drawing and spinning trade; the manufacturing trade; the dyeing and finishing trade; merchandising. Similar subdivisions obtain in France and Germany, and the same tendency is distinctly manifesting itself in the United States of America.

The Wool Trade.—The two main branches are the English and the colonial. A third miscellaneous class includes mohair (Turkey and Cape), cashmere, and a few special hairs employed in peculiar textures which become fashionable from time to time. Great Britain produces three classes of wool—(1) lustre, from Lincoln and Yorkshire; (2) demilustre, from Leicester and Devon; (3) short—*i.e.* South Down and Hampshire. Formerly Australia produced only Botany (merino sheep) or fine wools; but to-day certain districts have imported the long-wool Lincoln sheep and crossed it with the merino, thus producing what is known as colonial cross-breed. The Argentine exports long wool approaching the English long wool. This is of course grown from English stock. English wools are marketed in the greasy or washed state according to local conditions.

The Preparing and Combing Trade.—The two classes of wools—long and short—are treated differently. Long wool is first prepared by passing it through what are termed 'preparatory gill-boxes'; secondly, combed—*i.e.* the short fibres (noil) are combed out from the long fibres (top); and, thirdly, these long fibres are 'finished,' or got into a more or less parallel condition, ready for the subsequent drawing and spinning operations. Short wool is first prepared by passing it through a carder in most respects similar to the woollen carder; secondly, it is backwashed (to prepare for the combing operation), which consists in passing the slivers through a cleansing solution, drying over heated drums, and gilling; thirdly, it is combed to divide the sliver into 'top' and 'noil'; and fourthly, it is finished to straighten the 'top' in readiness for the drawing and spinning operations. The preparing gill-box consists of back rollers, running comparatively slowly, which receive the wool; gills—*i.e.* combs, which receive and comb out the fibres by running at a greater speed than the back rollers; and front rollers, which, running at a definitely greater speed than the back rollers or gills, draft the slivers according to requirements. Thus six slivers may enter the back rollers, yet the resultant sliver from the front rollers will be as thin, or perhaps thinner, than any one of the six slivers entering. The finishing gill-boxes following the comb act on precisely similar lines, only they may be lighter in build according to the strength of the top to be treated. The carder is similar to the woollen carder, but is arranged

NOBLE'S COMBING MACHINE

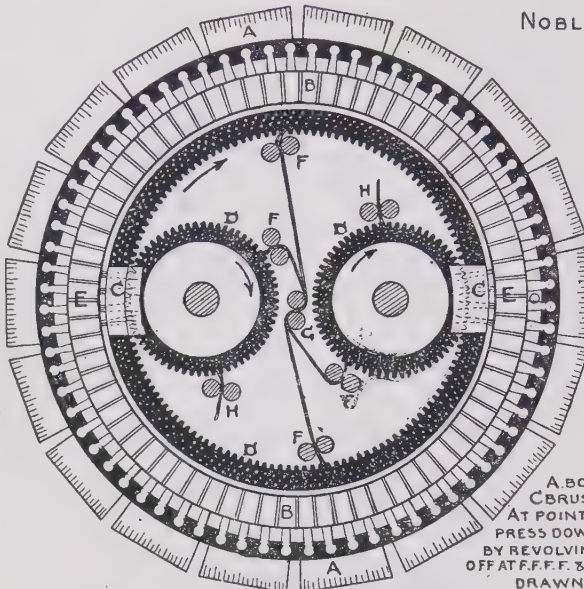
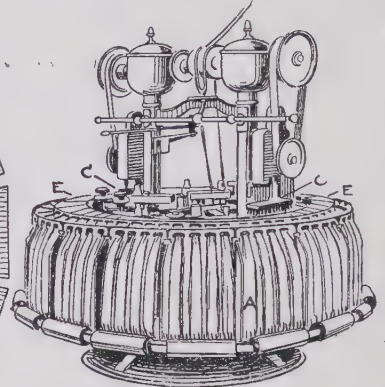
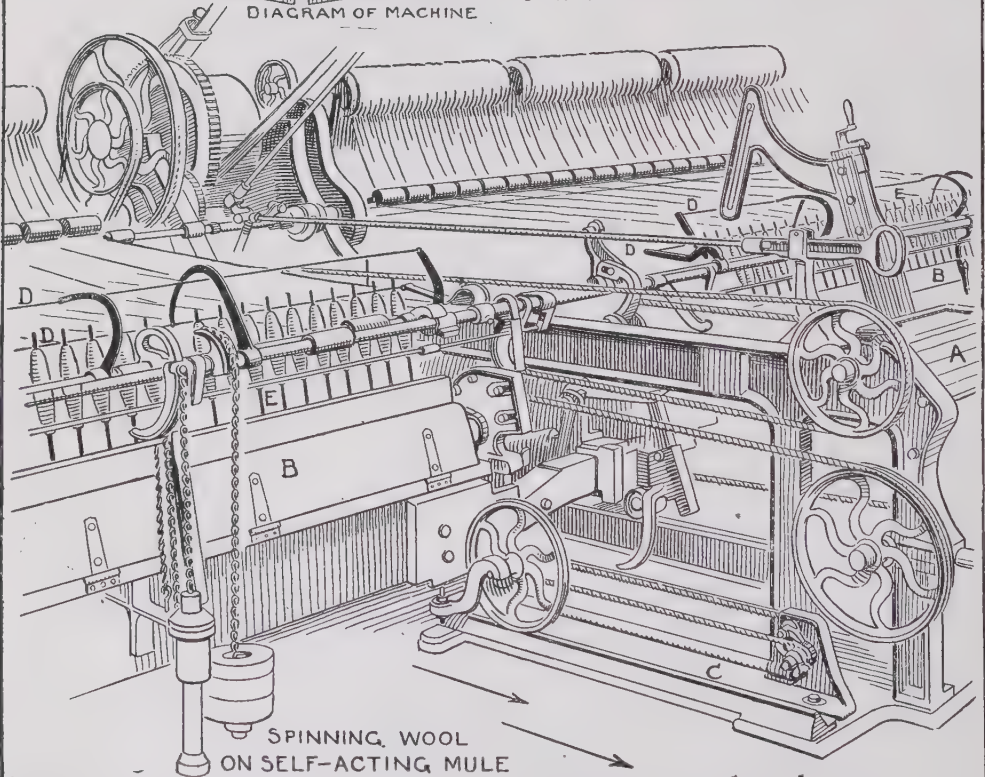


DIAGRAM OF MACHINE



EXTERNAL VIEW OF MACHINE

A. BOBBINS OF CARDED SLIVERS. B. FEED BOXES. C. BRUSHES. D. COGGED CIRCULAR COMBS REVOLVING AT POINTS E. FEED BOXES RISE & FEED COMBS, BRUSHES PRESS DOWN WOOL WHICH IS PULLED APART OR COMBED BY REVOLVING COMBS. A CONTINUOUS SLIVER IS DRAWN OFF AT F. F. F. & WOUND UP AT G. NOIL OR SHORT WOOL DRAWN OFF AT H.



SPINNING WOOL ON SELF-ACTING MULE

A. HEADSTOCK OF MULE. B. B. CARRIAGES THAT RECEDE ON RAILS C TO GIVE DRAFT TO WOOL. D. FALLER & COUNTER-FALLER WIRES TO CONTROL WINDING ON SPINDLE E.

to give more of a combing operation, so that the ultimate sliver consists principally of wool fibres lying more or less longitudinally in the sliver. To facilitate this, large swifts, workers, and doffers are employed; and finally the sliver is drawn off from the centre of the last doffer, not from the side, as is the case in woollen carding. There are four main styles of comb employed:—(1.) Lister's comb, for long wools. (2.) Holden's comb, for short wools. The 'tops' produced on this comb are said to spin to a finer thread than the tops produced on any other comb. (3.) Noble's comb. This, from a mechanical point of view, is the most perfect machine, all the motions—with the noteworthy exception of the dabbing brush—being circular. By a change of the 'comb-circles'—easily effected—this comb will comb either long, medium, or short wools. (4.) The Heilman comb. This has only just established a position in this country, but in France it is very largely employed for fine wool. In all combs tufts of wool are held by one end and combed, then held by the other end and combed. Combers generally aim at producing a 'top' which will spin to a stated 'count of yarn'—say 56's, 60's, or 70's. The top is two or three times as valuable as the noil.

In the coloured yarn trade the comber deals twice with the same material. The wool is first combed in the gray or white state, then the 'slubbing dyer' takes the tops in hand and dyes them as nearly as possible to the shade required; finally, the comber again takes them and recombs them, thus straitening the long fibres and extracting all the short ones, which, if left in, would work out and produce a lumpy uncouth surface in the cloth.

The Drawing and Spinning Trade.—The operations of drawing and spinning consist in passing the tops as received from the comber through from seven to ten or eleven operations, of which the first two or three are practically similar to the gilling operations already described. All the subsequent operations, including the spinning, are 'drawing' operations—i.e. the boxes through which the slivers pass have no gills, but consist merely of back and front rollers, with small rollers or carriers—simply to support the slivers—in place of the gills. In preparing boxes, and in ordinary gill-boxes, the sliver is usually run into cans, but in the following machines it is found more convenient to wind it on to bobbins—these gradually decreasing in size along with the sliver. These bobbins, in con-

junction with the flyer, take up the yarn as delivered by the front rollers, and insert the requisite twist for the next operation. Thus, in both drawing and spinning, on this system the operation is continuous: doubling, drafting, and twisting all proceed at the same time—not intermittently, as on the mule. The operations of doubling and drafting practically make the worsted thread, the size or thickness of which depends upon the predominance of drafting over doubling, and the evenness upon suitable drafts and combinations of doublings and drafts.

In the last of the operations—i.e. the spinning—in addition to the doubling and drafting, much more twist is put into the yarn, to make a firm thread. If the yarn is for warp, usually two of the single threads are twisted together. Weft yarns, as a rule, are single, save for certain classes of goods, in which two-fold yarns yield a better fabric.

Yarns are placed on the market in eight forms—on spools, on double-headed bobbins, on cheeses, on cops, on tubes, in hank, in the warp state, and even on the warp beam.

The Manufacturing Trade.—The worsted coating manufacturer has from 50 to 200 looms, the lining and dress goods manufacturer perhaps as many as 1,000 looms. These, running largely on cotton or other inexpensive warps, and producing light stuff, will require no more capital to run them than 200 coating looms. The looms for the coating trade are usually of a heavy description. For the linings and dress goods much lighter looms can be employed, and a speed of from 150 to 200 picks per minute attained, as against from 70 to 130 for coatings. There is, however, a tendency to employ broad looms for dress goods, with a consequent reduction in speed. The fancy dress trade employs the Jacquard loom. The best manufacturer organizes his own designing department. If the manufacturer is not prepared to incur this expense, he gives the style of fabric that he requires to one of the designing firms; they make perhaps dozens of sketches, and the manufacturer selects the most likely. What figure designing is to the dress goods manufacturer, colour and weave are to the coating and trousering manufacturer. He must employ a complete staff of designers and pattern-weavers. As a rule, neither the coating nor dress goods manufacturer finishes his own goods.

The Dyeing and Finishing Trade.—The remarkable advance in textile chemistry and textile

physics has of late years revolutionized the finishing processes. The actual operations in finishing, as applied to dress goods, linings, etc., are many and varied; they include the following: 'Cravenette,' or waterproof and spot-proof process, for worsteds; the 'Pirle,' or waterproof and spot-proof process, for worsteds; the lustre mercerizing process, for giving a silk finish to cotton goods; the mercerizing process, for producing a crepon effect on goods manufactured from cotton and wool; the special permanent finish for Italians—the crabbing, tentering, and singeing operations for the well-known glacés or alpacas, and the brushing, cropping, pressing, etc., operations to obtain the 'Huddersfield finish.'

Merchanting.—Merchants purchase the fabrics either in the 'gray' or in the 'finished' state. The advantages of purchasing in the gray state are very evident: pieces can be stored and dyed to shade, and various finishes applied according to requirements. On the other hand, in the coloured trade the merchant has to run the risk of his colours and styles going out of fashion, and this places him at a disadvantage. In the plain trade—coatings, linings, dress goods, etc.—there is the same mixing up of grades and qualities observable as in the top-making trade.

THE 'STUFF' TRADE. — Raw Materials.—For warps, cotton is the material most frequently employed, although worsted, woollen, silk, and linen warps are by no means infrequent. The wefts, as a rule, are Botany, English, mohair, woollen, and silk.

Manufacturing.—In the case of plain goods, such as Sicilians and Italians, the actual manufacturing is very simple, the warps being ordered with the required number of threads and required length from the cotton spinner, and the required weight of weft in the required form from the worsted spinner. In the case of the figured goods, the conditions are much the same as for plain goods, with the addition of the public designer, who makes the necessary sketches, places these on point paper, and supplies the manufacturer with the necessary cut Jacquard cards.

In the case of plain standard makes, the merchant purchases goods in the gray, and has them dyed and finished according to his requirements. In the case of figured goods, he usually selects the designs to be put on to certain standard cloths. With fancy goods, in which colour, structure, and design play a part, he selects each season the styles most likely to run, only sometimes taking the

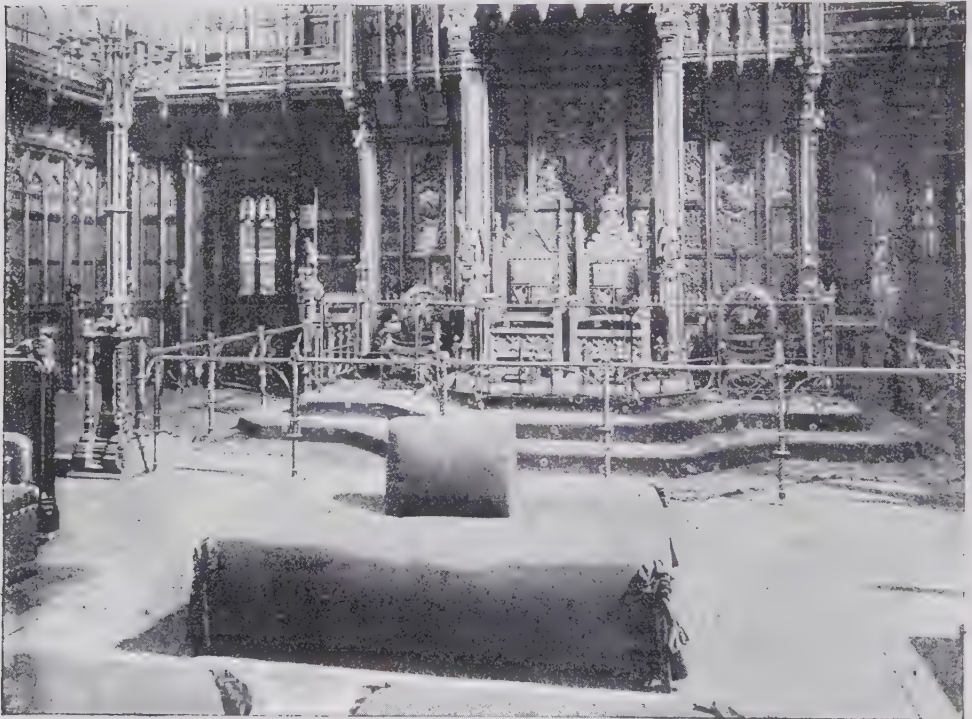
risk which the 'fancy-man' has always to run. See M'Laren's *Spinning, Woollen and Worsted* (1884); Barker's *An Introduction to the Study of Textile Design* (1903), and *The Analysis and Reproduction of Textile Fabrics* (1903); Fox's *The Power Loom*; Bell's *Jacquard Weaving and Designing* (1895); Beaumont's *Wool Manufacture* (1899), and *Colour in Woven Design* (1890); Stephenson and Suddards's *Ornamental Design for Woven Fabrics* (1897); Burnley's *The History of Wool Combing* (1889); Ashenhurst's *A Practical Treatise on Weaving*

historical engraver to George III.; engraved West's *Battle of La Hogue* (1781) and pictures by Claude, Wright, Carracci, and Vernet. See Fagan's *Catalogue, Raisonné* of his works (1885).

Woolman, JOHN (1720-72), American religious essayist, was born in W. Jersey, of a Quaker family, and early took up an apostolate against slavery, and finally induced the Quaker community to abandon all participation in the slave trade. His *Journal*, from the purity of its spirit and the grace of its style, has often been reprinted. One

joined (1852) the rush to the Australian gold fields. On his return to England (1854) he executed a bust of Tennyson, and from that time (1857) he was kept busy till his death, executing statues and busts—his *J. S. Mill* being the best of the former, the two *Tennysons* of the latter. He became R.A. in 1875, and was professor of sculpture at the Academy from 1877 to 1879.

Woolsack, the seat of the lord chancellor in the House of Lords. It is technically not part of the house, and the reason is that the lord chancellor is not



The Woolsack, House of Lords.

(Photo by H. N. King.)

(1893); Bradbury's *Calculations in Yarns and Fabrics* (1900); Herzfeld's *Testing of Yarns and Textile Fabrics* (1898); and Posselt's *Technology of Textile Design* (1889).

Woollett, WILLIAM (1735-85), English draughtsman and engraver, was born at Maidstone. In 1761, when he engraved the *Niobe* of Richard Wilson, he established his reputation as the best engraver of landscape in England. In 1776 he widened his sphere by engraving West's *Death of General Wolfe*, on which his fame rests. He was appointed

of his essays, *A Word of Remembrance and Caution to the Rich* (1793), was reissued as a Fabian tract at the end of the 19th century.

Woolner, THOMAS (1825-92), English sculptor and poet, was born at Hadleigh in Suffolk, and was for many years assistant to Behnes. He became acquainted with Rossetti, was one of the original pre-Raphaelite brethren, and contributed poetry to *The Germ*. About 1850 he abandoned idealistic sculpture, and confined himself to portrait medallions; but success did not come, and he

necessarily a peer. It is said that, when the exportation of wool was forbidden in the time of Elizabeth, a woolsack was placed for the lord chancellor to remind him of the source of national prosperity.

Woolsey, SARAH CHAUNCEY (1845), American authoress, born at Cleveland, Ohio, has, under the pseudonym of Susan Coolidge, written *The New Year's Bargain* (1871), *What Katy Did* (1872), *Nine Little Goslings* (1875), *For Summer Afternoons* (1876), *Eyebright* (1879), *A Short History of Philadelphia* (1887), and two

volumes of verse (1886-7). She edited *The Diary and Letters of Francis Burney* (1880).

Woolsey, THEODORE DWIGHT (1801-89), American educationist, born at New York. He was appointed professor of Greek at Yale (1831-46); then he became president of the college until 1871. He produced a large number of standard academic text-books and manuals—such as *Plato*, *Æschylus*, *Sophocles*, *Euripides*, *Herodotus*, and *Pindar*. In his later years he devoted much attention to international law, and wrote *Political Science, or the State Theoretically and Practically Considered* (1877), *Communism and Socialism* (1880). He was also chairman of the American Company of the New Tes-

(1725), in his *Discourses* (1727-9), and in his *Defences* (1729-30), until he was prosecuted for blasphemy and profaneness, and spent the remainder of his life in prison. His works were published in 5 vols., with *Life*, in 1733.

Woolton, or **MUCH WOOLTON**, tn., Lancashire, England, 6 m. E.S.E. of Liverpool; is a residential quarter. Red sandstone is quarried. Pop. (1901) 4,731.

Wool Trade. See **WOOLLEN TEXTILES**.

Woolwich, metropolitan bor., admin. co. of London, England, 8 m. E. of London, on s. side of Thames; there is a small portion on N. side. The Royal Arsenal, founded in the time of Henry VII., covers over 600 ac., with a river frontage of one mile. It com-

ized in military companies, and wear a uniform somewhat similar to that of the Royal Artillery. The governor and commandant holds the appointment for three years, and is selected alternately from the Royal Engineers and the Royal Artillery. The teaching establishment consists of eleven professors and instructors, some six of whom are civilians, and the rest officers of the Royal Artillery or Royal Engineers.

Woonsocket, city, Providence co., Rhode I., U.S.A., 15 m. N.N.W. of Providence; with cotton, woollen, and worsted mills. Pop. (1900) 28,204.

Woorali. See **CURARE**.
Wooster, tn., cap. of Wayne co., Ohio, U.S.A., 52 m. s.w. of Cleveland; has manufactures of



Woolwich Royal Military Academy.

(Photo by Higgins.)

tament Revision Committee (1871-81).

Wool-Sorters' Disease. See **ANTHRAX**.

Woolston, THOMAS (1670-1733), English deist, was born at Northampton, and became a fellow of Sidney Sussex College, Cambridge. A close study of Origen caused him to lose his faith in the literal truth of the Scripture narrative, and he conceived it to possess only an allegorical meaning. His volume, *The Old Apology for the Truth of the Christian Religion against the Jews and Gentiles Revived* (1705), was much read, though its statements are obscure. Becoming aggressive, he lost his fellowship (1721), and was deposed from the ministry. After that his controversial tone became more bitter, particularly in *The Moderator between an Infidel and an Apostate*

prises the laboratory, where ammunition of all kinds is manufactured; gun and torpedo factories; gun-carriage department; saddlery and harness, and ordnance store departments. From 15,000 to 20,000 men are employed. Woolwich is the headquarters of the Royal Artillery; and in the town and neighbourhood are the Ordnance College, large barracks, the Rotunda, a military and naval museum, and the Royal Military Academy. Pop. (1901) 117,178.

Woolwich Royal Military Academy, the school in which cadets are educated for commissions in the Royal Artillery and Royal Engineers. Candidates for admission must pass a somewhat difficult competitive entrance examination, and then join the academy for two years. The academy contains about two hundred cadets, who are organ-

engines, boilers, and agricultural implements. It is the seat of a Presbyterian university (1870), and of the Ohio Agricultural Experimental Station. Pop. (1900) 6,063.

Worcester. (1.) Municipal, parl., and co. bor. and city, Worcestershire, England, on the Severn, 15 m. s. of Kidderminster. The present cathedral, in part 11th century, has tombs of St. Oswald, Wulfstan, and King John. There are several ancient churches, an 11th-century commandery, and timbered houses. Manufactures include gloves, porcelain, carriages, railway signals, sauce, vinegar, and British wines. Pop. (1901) 46,624. **(2.)** City, Massachusetts, U.S.A., co. seat of Worcester co., 40 m. w.s.w. of Boston. The densely built portion is very irregularly laid out. Worcester is an important manufacturing city, producing foundry and

machine-shop products, boots and shoes, envelopes, watches, clocks, jewellery, and woodwork. It is the seat of Clark University, a Roman Catholic college, and a polytechnic institute. Pop. (1900) 118,421, of whom the number of foreign-born was 37,652, or 31.8 per cent.

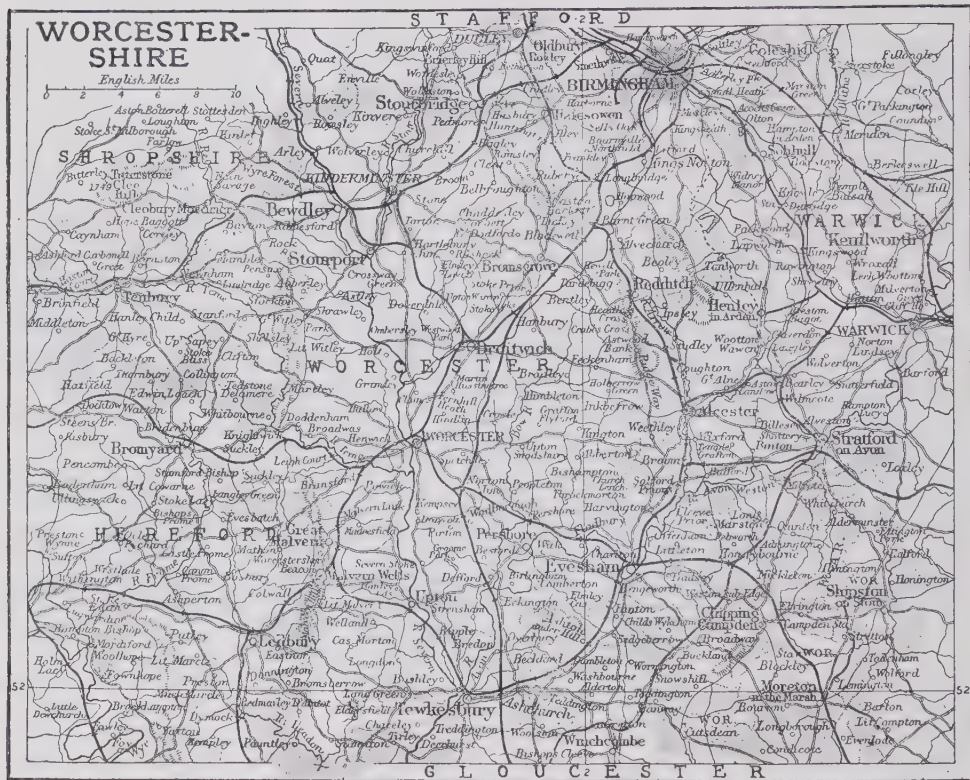
Worcester, EDWARD SOMERSET, SECOND MARQUIS OF (1601-67), inventor of the steam-engine, son of the first marquis, was successively Earl of Glamorgan (1644) and Earl and Marquis of Worcester. He passed much of

The Life, Times, and Scientific Labours of the Second Marquis of Worcester (1865).

Worcester, FLORENCE OF. See FLORENCE OF WORCESTER.

Worcester, JOSEPH EMERSON' (1784-1865), American man of letters, born at Bedford, New Hampshire; was a teacher at Salem, then took to literary hack work. All kinds of compilations flowed from his pen, from gazetteers to almanacs; but the most lasting were his dictionaries of the English language—*Pronouncing and Explanatory English*

very fertile. Hops and small fruit are cultivated. Coal is worked in N. and N.W., and fire clay manufactured at Stourbridge. There are brine springs at Droitwich and Stoke Prior. The porcelain manufacture (introduced 1751) is extensively carried on; other industries are ornamental tiles, carpets (Kiddermminster), iron and chain cables (Nether-ton), needles and fish-tackle (Redditch), glass, iron (Dudley, Stourbridge), gloves (Worcester). The county returns 5 members to Parliament. The Romans had a sta-



his time in experimental work at Raglan Castle, his father's seat. Being sent by the king in 1645 to Ireland to treat secretly with the Roman Catholics, his mission was betrayed, and he was imprisoned for treason. Escaping, he remained in exile till 1652, when he returned, and was incarcerated in the Tower till 1654. His *Century of Inventions* was published in 1663. Among these is 'an admirable and most forcible way to drive up water by fire.' In fact, he anticipated the steam-engine. He erected water-works at Vauxhall. See Dircks's

Dictionary (1830), *Universal and Critical Dictionary* (1846), and *Dictionary of the English Language* (1860).

Worcestershire, west midland co., England. The surface is diversified, well wooded, and hilly, especially on borders—Malvern Hills, s.w.; Bredon and Cotswold Hills, s.; Lickey and Clent Hills, n. It belongs almost entirely to the basin of the Severn; tributaries, Teme, Stour, and Avon. Canals connect the Severn with other rivers. The vales of Worcester (Severn), Teme (Teme), and Evesham (Avon) are

tion at Droitwich (Salinae). Area, 473,328 ac. Pop. (1901) 358,377.

Worde, WYKYN DE (d. 1534), printer, was born at Wörth in Alsace, and came to England about 1476 as Caxton's assistant. In 1491 he succeeded to Caxton's business, but, unlike his master, took no interest in the literary aspect of the work. Between 1493 and 1500 he issued at least 110 books. In 1500 he left Caxton's premises at Westminster for Fleet Street, and there printed small popular books. From 1501 till his death he printed more than 600 books.

Wordsworth, CHARLES (1806-92), bishop of St. Andrews, was born at Lambeth, London; and at Oxford had Gladstone and Manning among his pupils. He was master at Winchester (1835-46), and warden at Glenalmond, Perthshire (1846-54). In 1852 he was elected bishop of St. Andrews, and became a *persona grata* to all parties in the Scottish Episcopal Church. He published *Shakespeare's Knowledge and Use of the Bible* (1864), a *Greek Grammar* (1839), and *Shakespeare's Historical Plays* (1883).

Wordsworth, CHRISTOPHER (1774-1846), English writer, youngest brother of the poet, was born at Cockermouth, and became fellow of Trinity College, Cambridge, in 1798, and master (1820-41). He occupied several important livings in the English Church, and is known as the author of *Ecclesiastical Biography* (6 vols. 1810; 4 vols. 1839), *Who Wrote Eikon Basilike?* (1824, 1828), and *Christian Institutes* (4 vols. 1836).

Wordsworth, CHRISTOPHER (1807-85), bishop of Lincoln, was born at Lambeth, the nephew of the poet and son of Christopher Wordsworth. In 1836 he became headmaster of Harrow, in 1844 canon of Westminster, and in 1850 vicar of Stamford in Berkshire. In 1868 he was appointed bishop of Lincoln. He was frequently involved in controversy—e.g. with the Wesleyans in 1873, and in the great Coates case, where he had refused to institute a clergyman who had purchased a life interest in an advowson (1873-5). He was a prolific writer, and his books are scholarly and profound; among them are *Athens and Attica* (1836); *Greece* (1839); *Correspondence of Bentley* (1842); *Life of Wordsworth*, his uncle (1851); *The Greek New Testament* (1856-60); *The Old Testament* (6 vols. 1864-71); and editions of the early fathers. See *Life by Overton* and E. Wordsworth (1888).

Wordsworth, DOROTHY (1771-1855), only sister of the poet, kept house for him in his early struggling days, and shared to a large extent his poetical labours. Her own literary records consist of the *Journals* of her life at Alfoxden and Grasmere (ed. by Knight, 1897), and her *Tour in Scotland* (ed. by Knight, 1874). See *Life by Edna Lee* (1886).

Wordsworth, JOHN (1843), bishop of Salisbury, was born at Harrow, and is the eldest son of Christopher Wordsworth, bishop of Lincoln. He was assistant master at Wellington College in 1866; fellow of Brasenose College, Oxford (1867); prebendary of Lincoln (1870); Bampton lecturer (1881); Oriol professor

of the interpretation of Holy Scripture, fellow of Oriol, and canon of Rochester from 1883 to 1885. In 1885 he was consecrated bishop of Salisbury. As a scholar he has a high reputation.

Wordsworth, WILLIAM (1770-1850), English poet, was born at Cockermouth in Cumberland. In 1790 he spent his vacation in France and Switzerland, and after securing his degree at Cambridge (1791) his enthusiasm for the French revolution led him to take up his residence in the former country. When the reign of terror broke out his strong sympathies with the Girondists seemed likely to involve him in danger; but when that movement fell into the hands of Napoleon, and the lust of conquest replaced the rights of men as its active inspiration, the reaction in Wordsworth's mind was intense. He abandoned his early ideals almost in their entirety, and fled to the opposite pole of conservatism.

In 1793 his poems *An Evening Walk* and *Descriptive Sketches* attracted the attention of Coleridge. His friend Calvert, dying in 1795, left the poet a legacy of £900, with a strong expression of his wish that the young man should make poetry the serious business of his life. Wordsworth and his sister now settled down at Race-down, near Crewkerne in Dorset, where they were visited by Coleridge. They then moved to Alfoxden in Somersetshire, in order to keep in touch with the new acquaintance, and from the conversations of the two young poets were born the *Lyrical Ballads*, which appeared in 1798. In this work the original intention was, as Coleridge tells us, that Wordsworth was to endeavour to clothe the events of common life in the spirit of poesy and romance, while to his companion was assigned the duty of humanizing and spiritualizing the supernatural and romantic. In company with his fellow-poet and his sister, Wordsworth went to Germany in the autumn of this year, spending the winter there with Dorothy, and on his return took up his residence in the Lake district near Grasmere. Here, in 1800, the second edition of the *Lyrical Ballads* was published, with the addition of the preface in which his theory of poetic diction first appeared. At Grasmere also *The Prelude* was begun, the opening part of the great philosophical poem, entitled *The Recluse*, to which the poet always looked forward as the goal of his efforts. In 1802 he married his early schoolmate, Mary Hutchinson. In 1807 he produced two fresh volumes, containing some of his finest verse—the sonnets on *Liberty*, the *Ode to Duty*, and

the *Ode on the Intimations of Immortality*, together with the poems suggested by his Scotch tour of 1803. In 1808 he removed from Grasmere to Allan Bank, and finally in 1813 to Rydal Mount, where he passed the remainder of his life. About this time also he secured the appointment of distributor of stamps for the county of Westmorland. The year 1814 saw his second tour in Scotland and the publication of *The Excursion*, the second part of his philosophical poem, and the only part of it published during his lifetime—*The Prelude* not seeing the light until a few months after the author's death. The very unkind reception given to this work in no wise daunted the poet. *The White Doe of Rylstone* appeared in 1815, *Peter Bell* in 1819, while there followed one another in rapid succession *The Waggoner* (1819), the sonnets on the river Duddon (1820), the *Memorials of a Tour on the Continent* (1820), and the *Ecclesiastical Sketches* (1822). In 1831 he paid his third visit to Scotland, and saw Scott before the latter's departure on his voyage to Naples; and *Yarrow Revisited* appeared in 1835. On the death of Southey he was appointed (1843) poet-laureate. Thirty-eight years after his death was published all that was written of the *Recluse*.

To the great majority of his contemporaries Wordsworth was an inexplicable enigma. Even kindred spirits like Keats found it hard to understand him. To critics like Jeffrey his poetry, both in theory and in practice, was an abomination. Jeffrey, of course, was typical of the professional critic of the day, who had been brought up in a certain definite creed, and stood out in unavailing protest against innovations in critical doctrine. Wordsworth challenges attention both as a critic and as a poet. His critical theories, as contained in his prose prefaces, laid emphasis on the doctrine that between the language of prose and that of verse there is no essential distinction. The language of impassioned prose is also that of poetry. So far Wordsworth's position has won universal consent. But when he asserts that the language of poetry is only that of impassioned prose, he enters on debatable ground. As Coleridge clearly showed, his own practice refutes his dogma; for under no conceivable circumstances could his own finer verses, such as the lines on *Tintern Abbey*, have been used in the speech of ordinary men. In short, while the poet was right in protesting against the hackneyed and unreal poetic diction of his own

immediate predecessors, he was manifestly wrong in asserting that there is no place in poetry for a diction removed from that of prose. His other main position is that all the elements of true poetic grandeur are to be found in their greatest purity in the lives of the poor and humble. But here, again, his fondness for pushing his theories into paradox led him sometimes to act on the

mystery of life—one who had discovered in nature that regulative principle of peace and order which seems so strangely lacking in the world of man. To our own generation Wordsworth remains a supreme poet in virtue mainly of that elementary power by which in the end all poets stand or fall—his absolute mastery of language, his power in his highest flights of inspiration to force

(1879) and Knight (1888). The prose works are accessible in A. B. Grosart's edition (1876). The principal *Lives* are those of Christopher Wordsworth (1851); F. W. H. Myers (English Men of Letters Series), 1880; J. M. Sutherland (1897), Elizabeth Wordsworth (1891), and Professor Knight (1889). See also the first hand sketches in De Quincey's *Recollections of the Lake Poets* (ed. 1889); Cottle's *Early Recollections of Coleridge* (1837); Crabb Robinson's *Diary* (1869); and *Memorials of Coleorton*, containing many letters (1897). Also Knight's *English Lake District* (1878), and *Through the Wordsworth Country* (1887); Stopford Brooke's *Theology in the English Poets* (1874); Hudson's *Studies in Wordsworth* (1884); Legouis's *Jeunesse de Wordsworth* (1896; Eng. trans. 1897); Masson's *Wordsworth, Shelley, etc.* (1874); J. R. Tutin's *Wordsworth Dictionary of Persons and Places* (1891); and Raleigh's *Wordsworth* (1903).

Work, in mechanics and engineering, is measured as the product of the resistance overcome and the distance through which it is overcome. This may be also stated as the product of the effective force and the distance through which it acts. In this country three distinct units are employed. The erg is the c.g.s. unit, the foot-poundal is the British scientific unit, while the British engineer's unit of work is the foot-pound. The work done by a force in foot-pounds is the measure of the effective component of the force in pounds multiplied by the distance in feet through which it acts. Thus, if a body of 100 lbs. weight is raised 6 ft. against gravity, then 6×100 foot-pounds of work are done on it. It has then gained potential energy, and can do, neglecting friction, 600 foot-pounds of work in sinking back to its original position. This illustrates the conservation of energy. When the force, say a pull of P lbs., makes an angle θ with the path, then on the level, through a space S feet, the work done is $SP \cos \theta \times S$ (foot-pounds), $P \cos \theta$ being the effective component of the force. Such a pull would be measured by a traction dynamometer or simple spring balance. If an agent does work at the rate of 33,000 foot-pounds per minute, it is working at the rate of one horse power. Work may be expended in straining a body, such as a spring; this stores mechanical energy, which will be given back when required, except what has been dissipated in friction. The equation of work is simply an application of the conservation of energy. Supposing 100 foot-pounds of work



William Wordsworth.

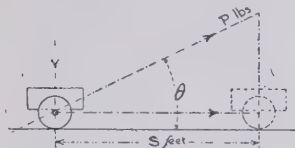
(From the portrait by F. Pickersgill, R.A., in the National Portrait Gallery.)

principle that the mere lowliness and humility of a character or subject makes it necessarily a fit object for the poet. With all his defects in this way, however, it may be affirmed that Wordsworth has been one of the great critical formative influences of modern poetry. To the generation succeeding his own he appeared as one who, beginning by loving nature for her own sake, had ended by finding in her the key to the

language to its utmost limits of expressiveness.

Editions of the collected works were published by Moxon under the author's supervision in 1836-7, 1845, and 1849-50. Later editions are John Morley's (1888); Professor Dowden's (1893); and the complete edition produced by Professor Knight in 1896-7, containing life, prose prefaces, etc. Selections have appeared under the editorship of Matthew Arnold

be given to a machine, then, if there be no waste or store of energy, exactly the same amount, 100 foot-pounds of work, should be given out by the machine in some more convenient form. In theoretical investigations connected with machines this loss by friction is frequently neglected, and the equation of



Work Diagram.

work is applied; but the results so obtained are only approximately true. In the case of a particle moving in space under a system of applied forces, if ds be an arc of the path of a particle and s the tangential component of the applied forces, the work done on the particle between any two points is $\int s ds$ between proper limits. With rectangular co-ordinates this becomes—

$$\int (x \frac{dx}{ds} + y \frac{dy}{ds} + z \frac{dz}{ds}) ds,$$

where xyz are the three component forces parallel to the three axes. If the resultant of xyz be perpendicular to ds , then

$$x \frac{dx}{ds} + y \frac{dy}{ds} + z \frac{dz}{ds} = 0,$$

which shows that, if the direction of motion of a body be always perpendicular to the acting force, no work is done. In a conservative system of forces

$$\int (x \frac{dx}{ds} + y \frac{dy}{ds} + z \frac{dz}{ds}) ds$$

depends on the initial and final conditions, and is independent of the path pursued, and the expression under the sign of integration is equivalent to a complete differential. If this be $-dv$, where v is the potential energy, the equation $\frac{1}{2} \sum (mv^2) + v = H$ may be obtained, H being a constant and $\frac{1}{2} \sum (mv^2)$ the kinetic energy of the system. Hence the sum of the kinetic and potential energies of the system is constant, which is the conservation of energy.

Work, HENRY CLAY (1832-1894), American song-writer, born at Middleton, Connecticut; came into notice during the civil war by his song *Marching through Georgia*. Among his other songs are *Nicodemus the Slave*, *My Grandfather's Clock*, and *Lily Dale*. He also wrote *The Upshot Family; a Serio-comic Poem* (1868).

Workhouse. See POOR LAW.

Workington, munic. bor. and seapt., Cumberland, England, on the Derwent; has manufactures of steel rails, boilers, and motor vehicles, and shipbuilding. Pop. (1901) 26,143.

Works and Buildings, COMMISSIONERS OF, consist of a salaried first commissioner, the principal secretaries of state, and the president of the Board of Trade. They were appointed by an Act of 1851, and were entrusted with the management of the royal parks, Trafalgar Square, the Menai bridge, and many public works. By later acts they took over the Supreme Court buildings at Edinburgh in 1852, fifteen public statues in London in 1854, the Royal Courts of Justice in 1865 and 1871, the Bankruptcy Courts in 1868, the Ordnance Survey and the county courts in 1870, the customs buildings in 1879, the Inland Revenue buildings in 1881, the site of Millbank prison in 1892. Under the Ancient Monuments Protection Acts, 1882 and 1892, they may take charge of ancient public monuments. The metropolitan police courts were transferred from their custody to that of the London County Council in 1897, and the Victoria, Battersea, and Kennington parks, the Chelsea embankment, and the Bethnal Green Museum garden were transferred to the predecessors of the London County Council in 1887. In Ireland there is a separate Board of Public Works, the duties of which are wider than those of the commissioners in England.

Workshops, REGIMENTAL. By the King's Regulations officers commanding units are authorized to establish workshops for training soldiers in various trades. In July 1906 a War Office committee reported in favour of the general extension of these workshops, in order to give a soldier a better opportunity of obtaining employment upon his return to civil life.

Workshops Regulations. See FACTORIES AND WORKSHOPS.

Workshop, mrkt. tn., Notts, England, 12 m. N.N.E. of Mansfield. Coal-mining, malting, and woodwork (Windsor chairs, etc.) are the principal industries. The great gatehouse is the remnant of a priory founded in the time of Henry I. From the number of mansions in the neighbourhood the district has been named the 'Dukeries.' Pop. (1901) 16,612.

World, in a strict sense, refers to the inhabitable globe, the area of human activities, rather than to the physical earth as a whole, to which it is sometimes applied.

World, THE, an English society journal, founded by Edmund

Yates in 1874, in partnership with Grenville Murray. It promised 'to recognize women as a reasonable class of the community,' and 'to receive contributions from persons of rank who know anything worth communicating.' The new paper speedily became an assured success, and its columns, under the heading 'What the World Says,' were regarded as the best authority on the movements of smart society. Mr. Labouchere contributed articles upon financial subjects. Mrs. Lynn Lynton wrote her fierce attacks on the vagaries of modern society—of which the first was the series entitled 'Jezebel à la mode.' H. W. Lucy was the Parliamentary correspondent, and other contributors were T. H. S. Escott, Comyns Carr, and Archibald Forbes. One of the features of the *World* has always been its half character-sketch, half interview with some distinguished person, published under the title of 'Celebrities at Home.' Edmund Yates died in 1894, when Mr. Francis Drummond succeeded to the editorship. In 1905 the controlling interest in the *World* was acquired by Lord Northcliffe, and Mr. Cosmo Innes became editor.

Worm, the thread of a screw. If the thread is arranged to engage the teeth of a cog-wheel and the screw be turned, it gives a slow movement to the wheel. This is one method of obtaining a slow speed of rotation from a high one like that of an electric motor.

Worm Grass. See PINK ROOT.

Worms, tn., Hesse-Darmstadt, Germany, on l. bk. of Rhine, 10 m. by rail N.N.W. of Mannheim; has manufactures of leather, cloth, tobacco, machinery, and chemicals, and produces the Liebfrauenmilch wine. Its Romanesque cathedral dates from the 8th century; its main portions from the 11th and 12th centuries. Other interesting ecclesiastical buildings are the church of St. Paul, now used as a museum; the church of St. Martin, the Liebfrauen church, and the ancient Jewish synagogue. The episcopal palace, the meeting-place of the Imperial Diet before which Luther appeared in 1521, is now part of a private house. Originally the Celtic Borbetomagus, Worms was a Roman town till the 5th century, when it was made the capital of the Burgundian kingdom. It was repeatedly the residence of the Frankish kings (Charlemagne, etc.). Annexed to France in 1801, Worms was finally annexed to Hesse-Darmstadt in 1815. Some of the more stirring events in the history of Worms find a place in the *Nibelungen-*

lied. Pop. (1900) 40,714.—DIETS OF WORMS, meetings of the representatives of the old German empire which met at Worms. In 1495 the emperor asked for the aid of the empire for an expedition to Italy, and agreed to allow the proclamation of a perpetual public peace in consideration of the establishment of a tax, called the common penny, upon all property, and of a poll-tax. The diet also recognized the Imperial Cameral Court, which was to have supreme jurisdiction in cases between the states of the empire, and to have power to pronounce the ban of the empire. In 1521 a still more

Worms, or VERMES, formerly constituted an important grade in the classification of animals, but more recent research has shown that many of the so-called 'worms' are unrelated to 'one' another. The term has, however, still a certain convenience, but it should be carefully noted that the elongated flexible body which is the connotation of the term as popularly used is an adaptive character pure and simple, fitting its possessors for a particular mode of life. Among fish, among amphibians, among reptiles ('blindworm') there occur wormlike organisms. Zoologically, the following may be called

its bitter properties. The plant was of some importance among the Mexicans, women wearing on their heads garlands of wormwood in a certain religious dance. Wormwood is used in the preparation of absinthe. It was formerly also used to keep away moths from clothing.

Wormwood Scrubbs, district in W. of London, with recreation ground, rifle range, and large convict prison.

Wornum, RALPH NICHOLSON (1812-77), English art critic, was born at Thornton, near Norham, N. Durham. After spending six years in the galleries at Munich, Dresden, Rome, Florence, and



Worms and its Cathedral.

(Photo by the Photochrom Co.)

famous diet met here. It had to consider—(1) measures to stop private war; (2) the appointment of a government during the emperor's (Charles V.) absence in Spain; (3) the attitude to be adopted towards Luther; (4) the French war; (5) the succession to the hereditary dominions of the Hapsburg house in Germany. The Edict of Worms was issued by the diet which met in 1521. The pope had issued a bull against Luther, who came to Worms under a safe-conduct, but refused to recant. On April 19, 1521, Charles V. declared him a heretic, and in May the diet issued an edict condemning him and his party.

worms:—The Platyhelminthes, or flatworms, including flukes and tapeworms, and their allies, some of which are not wormlike in shape; the Nemertea, or ribbon worms; the Nematelminthes, or roundworms, including several of the parasitic 'worms' of man; the Annelida, or segmented worms, including earthworms and their allies, the marine worms, the leeches, and some small divisions; also a considerable number of smaller groups, some of very uncertain position, as, for example, the curious 'worm' *Balanoglossus*.

Wormwood, an aromatic herb, *Artemisia absinthium*, which has long been held in high repute for

Paris, he established himself in London as a portrait-painter, but was soon occupied in writing about art; and in 1847 was authorized to issue a catalogue of the National Gallery, a work so well done that it led to his appointment in 1854 as keeper of the National Gallery. He wrote *The Epochs of Painting* (1847), *Analysis of Ornament* (1856), and *Life of Holbein* (1867).

Worsaae, JENS JACOB ASMUSSEN (1821-85), Danish archæologist, born at Vejle in Jutland; was employed in the archæological museum at Copenhagen (1838-43), and became professor in the university (1854), then (1866) director of the ar-

chæological museum and (1877) director of the national historic museum. He was minister of education (1874-5). His principal works have been translated into English: *Primeval Antiquities of England and Denmark* (1849), *The Danes and Norwegians in England* (1852), and *Pre-History of the North* (1886). One of his best-known publications is *Syl-land's Danskhed* (1850), written in opposition to the views of Jacob Grimm.



Wormwood.

1, Outer floret; 2, inner floret.

Worsborough, tnsip., W. Riding, Yorks, England, 3 m. s. of Barnsley; has collieries, gunpowder mills, and sawmills. Pop. (1901) 10,336.

Worsted. See YARNS, WOOLEN TEXTILES!

Wort. See BREWING.

Wörth, vil., Alsace, 12 m. s.w. of Weissenburg; was the scene of the defeat of the French under MacMahon by the Germans under the Crown Prince of Prussia on Aug. 6, 1870. Reichshofen is the name the French give to the battle. Pop. 1,100.

Worth, CHARLES FREDERICK (1825-95), ladies' tailor and costumier, was a native of Bourne in Lincolnshire. He went to Paris in 1846, and after a time began business as a costumier, in partnership with Bobergh, a Swede, who retired about 1871. Owing to the patronage of the Empress Eugénie, Worth's rapidly gained a reputation as the first house in the world for the design and execution of novelties in fashions. See *Annuaire Bottin* (1859).

Worthing, munic. bor. and wat.-pl., Sussex, England, 12 m. w. of Brighton; includes Heene or W. Worthing. The mother church of St. Mary, Broadwater, is partly Norman. In the vicinity are ancient earthworks. Pop. (1901) 20,015; est. pop. in extended bor. (1905) 25,000.

Wotton, SIR HENRY (1568-1639), English poet and diplomatist, was born at Boughton Malherbe in Kent. In 1595 he became secretary to the Earl of Essex, but left him before his disgrace, and settled at Venice. In 1602 he was sent, disguised as Octavio Baldi, by the Duke of Tuscany, to warn James VI. of Scotland of a plot against him. James, in gratitude, made Wotton ambassador to Venice in 1603; and here he remained until 1624, when he retired upon the provostship of Eton. His principal works are *Reliquiæ Wottonianæ* (1651); *State of Christendom* (1657); poems, collected in *Hannah's Courtly Poets* (1870). See *Lives* by I. Walton (1651); by A. W. Ward (1898).

Wotton, WILLIAM (1666-1726), English scholar, was born in Suffolk, and showed a precocious aptitude for languages. In 1694 he published *Reflections upon Ancient and Modern Learning*, which drew down on him Swift's satire in the *Battle of the Books*. He studied Welsh to such purpose that he edited the bardic laws of Hywell Dha, published after his death as *Leges Wallicæ* (1730).

Wounds may be either subcutaneous or open with division of the integument. A contusion of soft parts and a simple fracture of bone are examples of subcutaneous wounds. Open wounds are described as incised, lacerated, contused, or punctured, according to the manner of their production; but by a more convenient classification cognizance is taken of differences in their processes of repair, and they are divided into those with loss of substance and those without loss of substance. An open wound with loss of substance may heal by cicatrization. A clot of blood forms a crust on the surface, and becomes organized into fibrous tissue, while epithelium from the surrounding skin grows inwards over the whole wound, after which the crust, or scab, falls off. Should the clot break down from putrefaction or from another cause, suppuration takes place, and repair proceeds more slowly by granulation or 'second intention.' In open wounds, without appreciable loss of tissue, the surfaces may be brought into contact and retained in position. A thin layer of coloured clot then becomes organized to form the bond

of union between the severed surfaces. This process is called healing by 'first intention.' The surfaces, however, may be kept apart till they become glazed, and may then be brought together, when union takes place by apposition, the layer of clot in this case being colourless.

Incised wounds are generally clean cuts made by a sharp instrument or by a blow over a bony surface. They usually gape and bleed freely. The surgeon should endeavour to procure healing by first intention. Lacerated wounds present irregularities with more or less tearing of the tissues, and consequently lowered vitality of the edges of the wound, as a result of which sloughing is apt to occur. Contused wounds have the edges bruised and their vitality depressed. They usually heal by second intention, the devitalized tissues being absorbed or cast off as a slough. Punctured wounds are dangerous on account of their depth. They generally heal by second intention, and the surgeon's aim should be the promotion of free drainage, so as to prevent accumulation of fluid and consequent tension below the surface.

In the general treatment of wounds rest, constitutional and local, is essential. Sedatives, such as opium, may be necessary. In all wounds immobility of the adjacent tissues should be secured by splints or other apparatus. A horsehair stitch may act as a sufficient splint in certain positions, and is better adapted to some injuries than more elaborate apparatus.

Poisoned wounds, whether caused by noxious animals, such as snakes, or by microbes and their products, are described under separate articles.

Woundwort, or SAND CLOVER, a hardy herbaceous plant belonging to the order Leguminosæ. It bears spikes of yellow flowers and clover-like leaves. Thriving in the poorest of soils, it has value as a cultivated forage plant. Woundwort is also the popular name of some species of *Stachys*. See STACHYS.

Wouwerman, PHILIPS (1619-68), Dutch artist, born at Haarlem. He worked for a time at Hamburg under Decker, but returned to Haarlem (1640), where he taught painting, and had among his pupils his brothers Jan and Pieter. He is especially famous as a painter of horses. His brother Jan (1629-66) was born and lived at Haarlem, and was a painter of landscapes and canals. Pieter (1623-82), also born at Haarlem, settled at Amsterdam. He was a landscape painter, and assisted Philip.

Wrack. See GRASS-WRACK.

Wrangel, CARL GUSTAF, COUNT (1613-76), Swedish general, born at Skokloster, near Upsala; distinguished himself under Gustavus Adolphus, especially at the passage of the Lech (1632), and under Torstensson; defeated the Danish fleet off Fehmarn in 1644, and was appointed (1645) generalissimo of the Swedish forces in Germany, as well as field-marshal and senator. In 1651 he was created a count. He served under Charles X. in the Polish war, especially in the three days' battle of Warsaw (1656), and followed the king to Denmark, when he took Fredericia (1657) and Kronborg (1658). He was a member of the regency during the minority of Charles XI., and was appointed commander-in-chief during the disastrous war with Brandenburg, ending in the rout of Fehrbellin (1675).

Wrangel, FERDINAND, BARON VON (1794-1870), Russian Arctic explorer, born at Pskov, of Swedish extraction. In 1820 he commanded an expedition to the Arctic regions, and, first in 1817 and again in 1825, made voyages round the world. He was governor of Alaska (1829-34), and from 1853-8 he held the post of minister of marine. Wrangel wrote some books of travel, the best known being *A Journey on the Northern Coast of Siberia and the Icy Sea* (1841). See Mrs. Sabine's *Wrangel's Expedition to the Polar Sea in 1820-3* (1840).

Wrangel, FRIEDRICH HEINRICH ERNST, COUNT VON (1784-1877) Prussian general, born at Stettin; distinguished himself in the wars against Napoleon. He suppressed the insurrection in Münster in 1837, and in Berlin (1848). In the same year he commanded the German forces in Schleswig-Holstein; and he commanded the allied armies at the beginning of the war with Denmark (1864). See *Life*, in German, by Maltitz (1884).

Wrangel Land. See ARCTIC EXPLORATION.

Wrangler. In old times the word 'wrangle' was used in the universities in the sense of 'to dispute publicly'—that is, to defend or oppose a thesis. Wrangler is now only used to distinguish one who has passed the mathematical examination for the bachelor's degree in the University of Cambridge with such credit as to have had his name inscribed in the highest list, or list of wranglers. Of these the first in merit is the senior wrangler. The second list is that of senior optimes, and the third that of junior optimes. Till 1883 there was only one examination; since then there have been two. Among the senior wranglers have been Professor

Airy (1823), Bishop Philpott (1829), Professor Kelland (1834), Bishop Cotterill (1835), Professor G. G. Stokes (1841), Professor Cayley (1842), Isaac Todhunter (1848), Professor P. G. Tait (1852), T. B. Sprague (1853), E. J. Routh (1854), Lord Rayleigh (1865), Professor Niven (1867), Professor Hopkinson (1871), Professor Larmor (1880). In 1890, in part iii., Miss Fawcett was placed before the senior wrangler.



Striped or Red Wrasse.

Wrasses (Labridæ), a family of bony fish, including a large number of littoral forms, most abundant in the tropics, and generally possessing curiously thick lips. They feed on molluscs and crustaceans, and have strong teeth adapted for crushing the hard shells of these animals. The body is covered with cycloid scales, and is often brilliantly coloured, and there is a single long dorsal fin, whose spinous portion is greatly developed. Among the wrasses of the type genus may be mentioned *Labrus maculatus*, the ballan wrasse, and *L. mixtus*, the striped or red or cook wrasse, both British. Both species occur in rock pools, and are edible. Among other wrasses mention may be made of the tautog, the goldsinny, and the parrot-fish or parrot-wrasses, while members of the genus *Otenolabrus* occur off the coasts of both Europe (including Britain) and N. America.

Wrath, CAPE, N.W. extremity of Scotland, Sutherlandshire, 13 m. W.N.W. of Durness church. It is a pyramidal mass, rising 300 ft. sheer out of the sea.

Wraxall, SIR NATHANIEL WILLIAM (1751-1831), author of historical memoirs, was born at Bristol; served the East India Company from 1769-72; then carried on negotiations between Caroline Matilda, queen of Denmark, and her brother George III. Returning to England in 1780 he entered Parliament, transferring his allegiance after a time from the side of Lord North to that of Pitt. His pamphlet, *A Short Review of the Political State of Great Britain* (1787), met with great success. The *Historical Memoirs of My Own Time*, from 1772-84 (2 vols. 1815), have had a lasting reputation, and were republished, with continuation to 1790 (3 vols. 1836). H. B. Wheatley's edition (1884) includes some *Reminiscences* before unpublished. Among Wrax-

all's other works are *Memoirs of the Valois Kings* (1777), and a *History of France from Henry III. to Louis XIV.* (3 vols. 1795).

Wray, JOHN. See RAY.

Wreck, in its original meaning, was the whole or part of a ship cast upon the land; but by the Merchant Shipping Act, 1894, wreck is defined to include also 'jetsam, flotsam, lagan, and derelict found in or on the shores of the sea or any tidal water.' When a vessel is wrecked, stranded, or in distress near the coast, it is the duty of the receiver of wreck of the district to proceed to the spot and take command of all persons present; he may requisition persons, horses, and carts to assist him, and is entitled to pass over adjoining lands, the owner having a charge for any damage on the things rescued. If any wreck is found in the United Kingdom, the finder, if he is the owner, must notify the receiver, or, if any other person, must hand it over to the receiver. If a receiver takes possession of any wreck, he must post a description of it in the nearest custom house, and also send the description to the secretary of Lloyd's, if the value exceeds £20. If the wreck is of small value or perishable, the receiver may sell it. The owner of wreck, if he establishes his claim within a year, is entitled to have the wreck or the proceeds of sale delivered to him upon paying salvage and expenses. In case a wreck is plundered, compensation is to be made in England or Scotland as in cases of riot, and in Ireland as in cases of malicious damage to property. Where a ship has been in distress or wrecked, a receiver, or at the request of the Board of Trade a wreck commissioner, holds an inquiry into the circumstances, and sends his report to the Board of Trade and to Lloyd's. In the case of unclaimed wreck, if any person has a franchise to claim it, it is to be delivered to that person, after payment of all expenses, salvage, fees, etc.; otherwise it is to be sold, and after deducting expenses the balance is to be paid to the officer of the crown. Harbour and lighthouse authorities have power to remove obstructive wrecks.

The number and tonnage of vessels lost in 1904 were—British, 86 vessels, with a gross tonnage of 179,926; foreign, 139 vessels, with a gross tonnage of 199,374. The figures for 1905 were—British, 90 vessels, tonnage 186,563; foreign, 204 vessels, tonnage, 331,126. Sailing vessels accounted for about one-third of the totals.

The number of ships wrecked has called into existence firms or companies whose sole business

is the salving of sunken vessels. The most practical methods of raising such ships are (1) the closing of all openings in the vessel's hull and then pumping out the water; (2) submerging hollow caissons, lashing them to the hull, and then pumping them out; (3) and lifting, by means of wire ropes or chains placed under the hull and attached to pontoons moored above—in this method the movement of the tide is utilized.

The most recent successful cases of wreck-raising are those of the White Star liner *Germanic*, sunk at the pier in New York harbour (1899); the ex-Spanish cruiser *Reina Mercedes*, sunk at the blockade of Santiago (1898); the *City of Worcester*, sunk in New London harbour (1898); the *China*, at Perim (1898); the *City of Paris*, on the Manacle Rocks, raised in 1898; the *Milwaukee*, at Aberdeen (1898); and a number of ships raised in the United States by the Merritt and Chapman Derrick and Wrecking Company. See Fawcett's 'Recent Notable Salvage Operations,' in *The Engineering Magazine* (January 1900); Noaker's 'Raising Wrecks in the Thames,' in *Cassier's Magazine* (May 1898); and Bell's 'Raising Sunken Vessels,' in *Cassier's Magazine* (August 1898).

Wrede, KARL PHILIPP, PRINCE (1767-1838), field-marshal of Bavaria, was born at Heidelberg; fought in 1800 with the French against the Austrians, Prussians, and Russians. After the retreat from Moscow he joined the coalition against France. At Hanau (1813), Napoleon, with an inferior force, beat Wrede, and the allies were compelled to retire. Wrede contributed materially to the success of the advance upon Paris (1814). See Heilmann's *Feldmarschall Fürst Wrede* (1881).

Wrekin. See SHROPSHIRE.

Wren, a general name for the members of the family Troglodytidae, which are passerine birds, most abundant in tropical America, but having in the wren of Europe (*Troglodytes parvulus*) a very familiar representative. The wrens have usually a moderately long and slender bill, the wings are short and rounded, the tail also is usually short, and is frequently carried over the back. The feet are strong, as is also the elongated metatarsus. The common wren reaches a length of about three and a half inches, and has a loud, ringing song, heard throughout the year. It builds a domed nest, and is remarkable for building additional nests, which are apparently used as shelters in unfavourable weather. The food consists chiefly of insects and their larvæ. The

other wrens are mostly small birds, some of which, like the warbling-wren or organ-bird (*Cyphorhinus cantans*) of S. America, have considerable powers of song. The name wren in combination is given to several members of the warbler family. See WARBLERS.

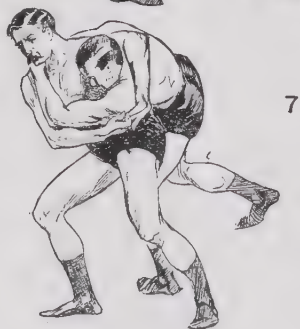
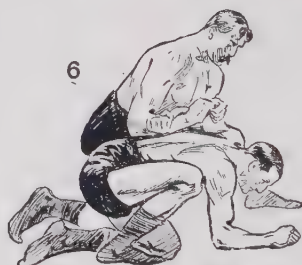
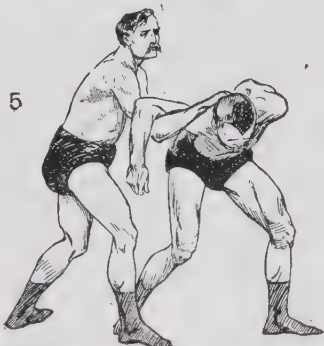
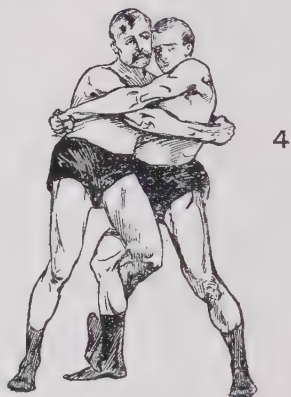
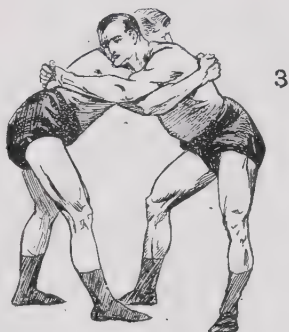
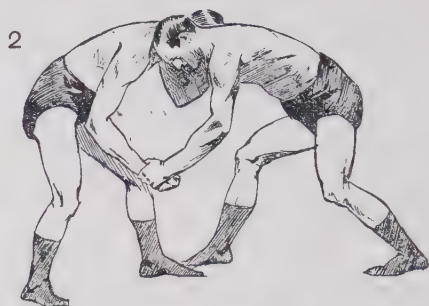
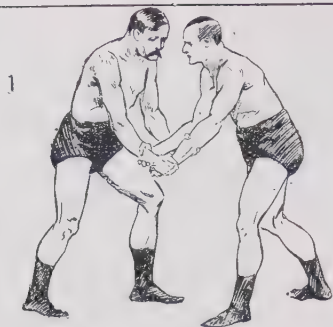


Common Wren.

Wren, SIR CHRISTOPHER (1632-1723), English architect, born at East Knoyle, Wilts. In 1637 he was appointed professor of astronomy at Gresham College, London, and four years later Savilian professor of mathematics at Oxford. Wren was one of the original members of the Royal Society. In 1661 he was appointed by Charles II. assistant to Sir John Denham, surveyor-general of the royal buildings, and was commissioned in 1663 to survey and report upon St. Paul's Cathedral with a view to its restoration, and was engaged on the Sheldonian Theatre, Oxford, and Trinity College, Cambridge. After the great fire of London he made a survey of the whole of the ruins, and proposed a plan for laying out the area with wide and commodious streets and squares, and with a line of convenient quays along the Thames. Unfortunately his plan was ignored. He was commissioned to rebuild the Royal Exchange, Chelsea Hospital, the Custom House, Temple Bar, the Monument, and the churches of St. Mary-le-Bon, Cheapside; St. Stephen's, Walbrook; St. Bride's, Fleet Street; St. Andrew's, Holborn; Christ Church, Newgate Street; St. James's, Westminster; further, Greenwich Hospital; Hampton Court; Buckingham Palace; Marlborough House, Ashmolean Museum, Oxford; and part of Windsor Castle. The first stone of St. Paul's, from Wren's designs, was laid on June 21, 1675; the choir was opened for divine service in 1697, and the whole was completed in 1710. Wren became president of the Royal Society in 1680. See *Lives* by Elmes (1852) and Phillimore (1881), also Milman's *Annals of St. Paul's* (1868) and Loftie's *Inigo Jones and Wren* (1893).

Wrestling is common to all nations, and has been brought to a science in countries so widely separated as England, Turkey, India, China, and Japan, each of which has its own laws and methods for the sport. The ancient Greeks held wrestling in high repute, as the public contests for professional wrestlers at Delphi, Corinth, Nemæa, and Olympia testify. History hands down to us the name of Milo of Croton, a great athlete, who for six years carried off the prize for wrestling in the Isthmian and Olympic games. Mr. J. Inouye states that in Japan the recorded history of the sport dates from 23 B.C., when the emperor matched two very strong men, named Kehayer and Nominno-Sukune, for a bout. The latter killed the former, and thus came to be tutelary deity of wrestlers in that country. Wrestling tournaments existed in England in the time of the Plantagenets, challenges passing between the cities of London and Westminster; but it appears to have been the pastime of the lower orders only. John Evelyn, in his *Diary*, mentions a wrestling match in St. James's Park (Feb. 1669) for £1,000—an enormous sum at that time—between the champions of the north and the west, which resulted in a victory for the latter. After the early part of the 18th century the sport declined, and it was not until early in the 19th century that a not very successful effort was made to revive it.

Of the many systems we can only mention those existing in Britain. (1.) The Cumberland and Westmorland style claims to be the best. In this, before the struggle is started, the competitors clasp each other, the left arm of each being over the right arm of his antagonist, and the chin on his right shoulder, with the hands gripped behind him. The object of the contest is to unloose the antagonist's clasp, and this accomplished the bout is won; it is also won if either party is forced to touch the ground with his knee or any part of his person. (2.) In the Cornwall and Devonshire system the wrestlers wear strong linen jackets, and stockings on their feet. The ring is thirty yards in diameter, and each has a 'sidesman,' or second, in the ring. The competitors take up a position opposite each other, stooping, feinting, and dodging in their efforts to get a good hold above the waist. This often takes a considerable time, so that the spectacle is apt to become monotonous. To constitute a 'fall,' two shoulders and one hip, or two hips and one shoulder, must



Positions in Wrestling.

1. 'Catch as catch can' hold. 2. First grip, catch hold style. 3. The hold. 4. The link. 5. The 'half-nelson.' 6. The hammer lock. 7. Cross buttock. 8. The hipe.

simultaneously touch the ground. Thus, when it comes to ground work, the worsted man tries to keep on his face, and a 'slippery' player may by adroitness long avoid defeat. In fact, so difficult is it to judge a contest of this sort indisputably, that it nearly always leads to wrangling, and this has militated against its popularity. (3.) Lancashire wrestling is on the system of 'catch as catch can,' and the tussle nearly approaches the barbarous. The competitors are nude, except for bathing drawers and stockings; they are allowed to take hold just as they please, and 'throttling' (although nominally disallowed) often enters into the struggle. Two shoulders down secures victory. See Armstrong's *Wrestling* (Badminton Library, 1893); Robinson and Gilpin's *Wrestling and Wrestlers* (1893); Rich and Bentley's *A New Book of Sports* (1885); J. Inouye's *Wrestlers and Wrestling in Japan* (1895); also JIU-JITSU.

Wrexham, munic. bor., Denbighshire, England, 11 m. s.w. of Chester. St. Giles's Church has a magnificent 16th-century tower. There are malt, iron, and terracotta works, tanneries, and breweries. Pop. (1901) 14,966.

Wright, CHARLES HENRY HAMILTON (1836), Irish lecturer, born in Dublin; delivered the Bampton Lectures (1878), the Donnellan Lectures at Dublin (1880), and Grinfield Lectures at Oxford (1893-7). He was vicar of St. John's, Liverpool (1891-8); and has written *Grammar of Modern Irish* (1856), *The Fatherhood of God* (1867), *Zechariah and his Prophecies* (1879), *Biblical Essays* (1885), *The Intermediate State and Prayers for the Dead* (1900), *Genuine Writings of St. Patrick, with Life* (1902), and *Roman Catholicism Examined* (ed. 1903).

Wright, JOSEPH (1734-97), English painter, was born at Derby, and made his reputation by pictures of figures illuminated by candle-light, such as *The Orrery*, *The Gladiator*, and *The Air-pump*; but his merits as a portrait painter are also very great. In 1773 he went to Italy, where the masters had less effect on his work than an eruption of Vesuvius which he witnessed. This led him to abandon candle-light pictures for conflagration scenes—not a happy change. He returned to Derby to paint portraits, and was elected R.A. (1784). See monograph by Bemrose (1886).

Wright, THOMAS (1789-1875), English philanthropist and prison reformer, was born in Manchester. He became interested in the reclamation of discharged prisoners, and in 1838 received permission to become a visitor in Salford

prison. Eventually he was offered a prison inspectorship, which, however, he declined. By public subscription an annuity was purchased for him, which set him free to give his whole time to prison work. See *Life* by M'Dermid (1876).

Wright, THOMAS (1810-77), English antiquary, born at Tenbury in Shropshire; and in 1836 went to London and began life as a man of letters. He edited a large number of Early English MSS., both historical and literary. A collection entitled *Reliquæ Antiquæ*, prepared in conjunction with Halliwell, was published in 1839-43. Among his other works are *Biographia Britannica Litteraria* (2 vols. 1842-6); *Essays on Archaeological Subjects* (2 vols. 1861); *The Celt, the Roman, and the Saxon* (1852 and 1885); *History of France* (3 vols. 1856-62). Wright was one of the founders of the Archaeological Association (1843), and of the Shakespeare and Camden Societies. He superintended the excavation of the Roman city of Uriconium at Wroxeter, and published an account of the city in 1872. See Llewellyn Jewitt in *The Reliquary* (1877-8).

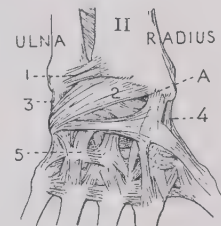
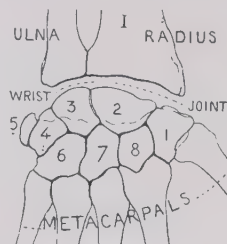
Wright, WILLIAM ALDIS (1836), English man of letters, and vicemaster of Trinity College, Cambridge, since 1888; from 1870 to 1885 he was secretary of the Old Testament Revision Committee. His works include editions of Bacon's *Essays* (1862) and *Advancement of Learning* (1869); the *Cambridge Shakespeare* (9 vols. 2nd ed. 1891-3), with W. G. Clark—textually the best edition extant; *Letters and Literary Remains of Edward Fitzgerald* (1889); *Fitzgerald's Letters to Fanny Kemble* (1895); *More Letters of Edward Fitzgerald* (1901); *Works of Edward Fitzgerald* (7 vols. 1903); *Milton's Poems* (1903); and *English Works of Roger Ascham* (1904).

Wrightia, a genus of tropical shrubs and trees belonging to the order Apocynaceæ. They usually have slender branches, and bear cymes of yellow, red, or white flowers, with salver-shaped corollas. They are sometimes grown as stove plants, in a light peat soil.

Wriothesley, HENRY, THIRD EARL OF SOUTHAMPTON (1573-1624), patron of Shakespeare, was born near Midhurst, Sussex. At court (1590) his handsome presence made him a favourite both with the queen and with the Earl of Essex. Florio, Nash, Barnes, Markham, and above all Shakespeare, found in him a generous patron. To him in 1593 were dedicated *Venus and Adonis*, and in 1594 *Lucrece*, and there is every probability that he is the patron and friend addressed in

the *Sonnets*. For participating in Essex's ill-starred enterprise he was condemned to death. The sentence was commuted, and at the union with Scotland he was released and restored to court favour by James I. In 1624, when an alliance with the Netherlands was formed, he headed an expedition thither, and died of fever at Bergen-op-Zoom.

Wriothesley, THOMAS, FOURTH EARL OF SOUTHAMPTON (1607-67), succeeded to the title in 1624. From Oxford he proceeded to the Continent, where he remained ten years. Returning to England, he ranged himself with the royalists. Cromwell permitted him to remain in England during the commonwealth. At the restoration he became lord high treasurer, an office he held till his death.



Bones (I) and Ligaments (II) of the Wrist.

Carpal bones:—1, Trapezium; 2, scaphoid; 3, lunar; 4, cuneiform; 5, pisiform; 6, unciform; 7, os magnum; 8, trapezoid. Ligaments:—A, wrist joint; 1, posterior radio-ulnar ligament; 2, posterior radio-carpal; 3, internal lateral; 4, external lateral; 5, posterior carpal ligaments.

Wrist. The strength of the wrist joint is derived chiefly from the numerous tendons, which are bound down close to the surrounding bones, and from the number of adjacent articulations among which shocks are distributed and violence is dissipated. For this reason dislocations at the wrist are rare—a more common result of injury, such as a fall, being a Colles's fracture, in which the lower end of the radius breaks off from the shaft about $\frac{1}{2}$ in. above the articular surface of the joint. A deformity of this joint, known as 'drop wrist,' is common in lead-poisoning, and is due to paralysis of the extensor muscles.

Writer's Cramp is a spasm occurring chiefly amongst those who write much, and especially amongst those who hold the pen in a bad way; and similar spasms occur amongst piano and violin players, tailors, telegraphists, composers, and others. In its early stage the affection is a true cramp. The writer jerks the pen involuntarily, and is conscious that he grasps it with excessive strength. Pain is often present, and is frequently associated with a feeling of intense fatigue in the muscles of the forearm and the ball of the thumb. A prolonged continuance of the condition may result in scrivener's palsy or paralysis. Electricity, rest, and massage only give temporary relief. Change of occupation is the only satisfactory remedy.

Writers to the Signet. See SIGNET, WRITERS TO THE.

Writing. The methods of writing of the ancients are treated of at PALEOGRAPHY, HIEROGLYPHICS, INSCRIPTIONS, and PICTURE WRITING. As regards modern writing, previous to the advent of the printing-press writing was divided into bookhand and cursive. Nowadays cursive writing alone is in use. The development of calligraphy was expedited by the invention of the steel pen, which supplanted the old quill. The rise of the science of graphology, or reading of character by handwriting, which in recent years has attained considerable vogue, affords an indication of the arbitrary character of the art of writing in modern times.

Writ of Summons (Lat. *breve*), in English law, a judicial summons ordering a party to appear to answer a claim. Under the Judicature Acts all suits and actions in the High Court (except matrimonial causes, and equity proceedings commenced by originating summons) are now commenced by writ of summons. Writs are issued in the name of the lord chancellor, and are endorsed with a statement of the relief claimed, or where the demand is for a liquidated sum of money, with a statement of the precise sum claimed. Writs require to be served personally, except where the defendant's solicitors agree to accept service, or the court on special grounds orders substituted service on some party other than him to whom the writ is addressed. The numerous forms of original writs in civil procedure have been superseded by a writ of summons —e.g. the *audita querela*, a means of relieving a defendant by a matter of discharge occurring after judgment. After having long been practically superseded by stay of execution, it was finally abolished under the rules made

by the Judicature Act of 1875. A writ of summons remains in force for twelve months, but may be renewed for six months from time to time by leave of the court.

Wrongs Imprisonment. See FALSE IMPRISONMENT.

Wroxeter, vil., Shropshire, England, on the Severn, 6 m. E.S.E. of Shrewsbury. Site of Roman *Uriconium*, and large Roman cemetery. Pop. (1901) 566.

Wrschowitz, tn., Austria-Bohemia, an E. suburb of Prague. Pop. (1900) 13,609.

Wryneck (*Tyrax*), a genus of birds, related to the woodpeckers, but differing from them in the soft tail, which has no spiny shafts, and the absence of bristles round the nostrils, which are partially covered by a membrane. The plumage is curiously mottled with black, brown, gray, and white, much as in the nightjar. Wrynecks feed upon insects, which they find chiefly upon the ground. They select a decayed branch or post, in whose cavity the eggs are placed. To England the common wryneck (*T. torquilla*) is a summer



Wryneck.

visitor, but it does not usually extend to the north. It comes about the same time as the cuckoo, hence the name of cuckoo's mate, while its habit of hissing when molested, and at the same time twisting the neck and turning the head about, give it the popular name of snake-bird. This species is widely spread over Europe and Asia, while the other three species are African.

W.S., Writer to the Signet (Scotland).

Wu-chang-fu, tn., cap. of prov. Hu-peh, China, on r. bk. of Yang-tse-kiang, opposite Hankow and Hankow; residence of viceroy of Hu-nan and Hu-peh, and of an immense number of officials. A mint and cotton cloth mills have been established. Pop. estimated at 500,000 to 600,000.

Wu-chau-fu, tn., prov. Kwang-si, China, on l. bk. of West R., below the confluence of the Kuei, 125 m. W. of Canton; is the port of transhipment of sea-borne goods for the West; was opened to foreign trade in 1897. Total annual value of trade over one million sterling. Pop. (1904) estimated at 53,000.

Wu-hu, tn. and treaty port, prov. An-hui (Ngan-hui), China, on r. bk. of Yang-tse-kiang; exports grain to the S., and has coal, tea, and silk in its neighbourhood. The total net trade in 1905 amounted to £4,608,933. Pop. (1904) estimated at 122,000.

Wulfstan (LUPUS) was archbishop of York from 1003 till his death in 1023, and at the same time bishop of Worcester till 1016. For him Ælfric wrote his pastoral letter, *Sermo ad Sacerdotes*. In the years 1010-1 Thorkill laid the country waste from East Anglia to Wessex, and these raids formed the occasion of Wulfstan's homily *Sermo Lupi ad Anglos*. Professor Napier, who has edited 'Wulfstan's Homilies' in the *Sammlung Englischer Denkmäler* (1883), accepts four only as the work of the archbishop out of the fifty-three assigned to him in Wanley's *Catalogus* (1705). See also Napier's *Göttinger Doktorschrift* (1882).

Wülker, RICHARD PAUL (1845), German student of Old English philology, born at Frankfurt-on-Main; has been professor of English literature at Leipzig since 1880, and since 1891 has been editor of the philological journal *Anglia*. Among his works are *Das Evangelium Nikodemi* (1872), *Altenglisches Lesebuch* (1864-80), *Grundriss zur Geschichte der Angelsächsischen Literatur* (1885), *Geschichte der Englischen Literatur* (1896; 2nd ed. 1906, etc.); and he has edited Grein's *Bibliothek der Angelsächsischen Prosa und Poesie* (1881 ff.), and the second edition of Wright's *Anglo-Saxon and Old English Vocabularies* (1884).

Wullenweber, JÜRGEN (1492-1537), Hanseatic statesman, born at Lübeck; was elected (1533) one of the burgomasters of his native city. He made great efforts to re-establish Hanseatic influence in the Baltic on a democratic and Protestant basis, and initiated a series of reforms in Lübeck, which his enemies overturned at the Diet of Spires. He was at length arrested, delivered to the Duke of Brunswick, and beheaded, his fall marking the end of the Hanseatic maritime supremacy in the Baltic.

Wundt, WILHELM MAX (1832), German physiologist and psychologist, was born at Baden, and began to lecture on medical subjects at Heidelberg; but he has become more widely known as an original and brilliant exponent of philosophy, of which subject he has occupied the chair at Leipzig since 1875. His *System der Philosophie* (1889) embraces his previous work in both science and metaphysics. The fifth edition of his *Principles of Physiological Psychology* has been trans-

lated into English by Professor E. B. Titchener (1904), and occupies a leading place in psychological literature.

Württemberg, kingdom of the German empire, lying between Bavaria, Baden, and Switzerland, and drained for the most part by the Neckar and its tributaries. The Danube crosses the country towards the S. The most striking geographical feature is the Swabian Alb, the most characteristic portion of the S. German Jura. The Black Forest borders the kingdom on the W. On the whole the surface lies high (3,000 to 1,500 ft.), the greater part belonging to one or other of the S. German plateau systems; but there are many valleys, all of great fertility. Agriculture is the principal industry. Wine and fruit are produced in large quantity, and market-gardening is actively pursued at Stuttgart, Ulm, Esslingen, Heilbronn, and elsewhere. The breeding and grazing of cattle is an important industry. The agricultural college of Hohenheim, near Stuttgart, is famous. Forests cover 31 per cent. of the area. Salt is the only mineral of consequence. There are mineral springs at Wildbad, Cannstatt, Göppingen, Hall, Reutlingen, and other places. There is a good deal of manufacturing industry of a varied character, the more important branches producing iron, gold and silver goods, cutlery, fire-arms, machinery, scientific and musical instruments, chemicals, prints and books, confectionery, and beer. Capital, Stuttgart. Area, 7,528 sq. m. Pop. (1900) 2,169,480.

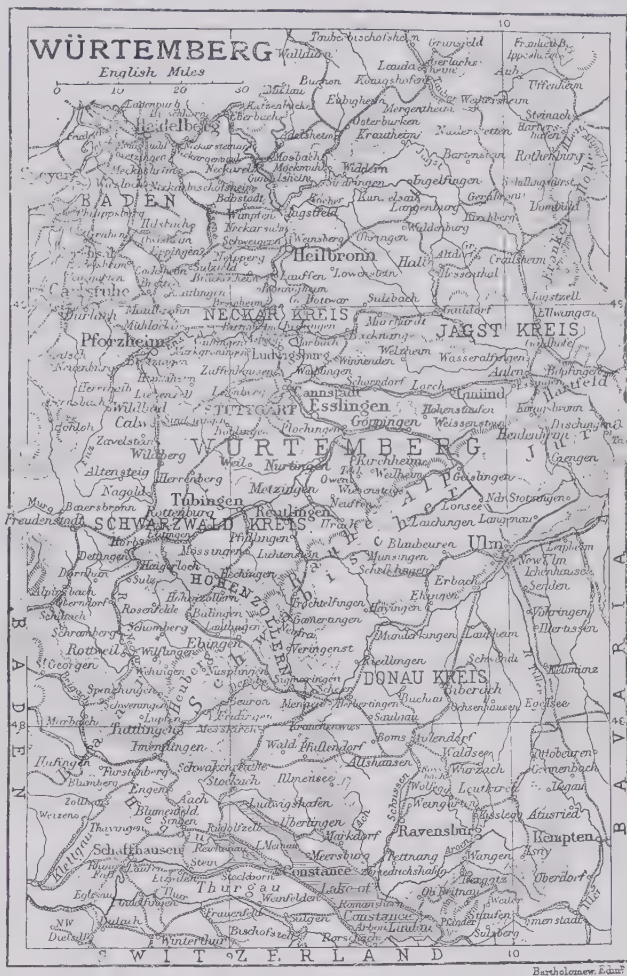
The bulk of the people (69 per cent.) are Protestants; the Roman Catholics, who have a bishop at Rottenburg, amount to 30 per cent., and there are nearly 12,000 Jews. The state university is at Tübingen, and there is a polytechnical high school at Stuttgart. Education stands at an exceptionally high general level, even for Germany; there is not a single individual in the kingdom over ten years of age who is unable to read and write. Württemberg has four votes in the Federal Council, and returns seventeen deputies to the Imperial Diet. The Württemberg troops constitute the 13th Army Corps of the German army: total strength, about 24,000. The king is a hereditary, constitutional sovereign. The territory now called Württemberg was settled by the Germanic Alemanni in the 3rd century after Christ, and in the 9th was incorporated in the duchy of Swabia. Ulrich (1241-65) was the first count. In 1495 the reigning count was made a duke of the empire; in 1802 the title of 'duke'

was exchanged for that of 'elector'; and in 1806 the title of 'elector' for that of 'king.' Between 1802 and 1809 the kingdom was greatly enlarged in area.

Wurtz, CHARLES ADOLPHE (1817-84), German chemist, was born in Strassburg, studied under Liebig and Dumas, and became professor of chemistry in Versailles in 1851, succeeding Dumas

Eng. trans. 1881), and *La Théorie Atomique* (1878; Eng. trans. 1880); he edited a *Dictionnaire de Chimie Pure et Appliquée* (1870-86), and the *Annales de Chimie et de Physique* (from 1852). See *Life*, in French, by Gautier (1884).

Würzburg, episc. see and cap. of prov. Lower Franconia, Bavaria, on the Main, here crossed



at the Sorbonne, Paris, in 1853. His principal researches, which resulted in the discovery of the substituted ammonias and of glycerol, were on the one hand of as great theoretical as his method of preparing phenol was of technical importance. He was a great teacher, and wrote among other works *Leçons de Philosophie Chimique* (1864;

by three bridges, 70 m. by rail S.E. of Frankfurt; has manufactures of tobacco and cigars, musical instruments, and furniture, machinery and railway carriages, and carries on a trade in wine. Its Romanesque cathedral was founded in the 9th century, enlarged in the 11th century, and restored in 1882-3. Among its other churches are Saint Bur-

kard, university and seminary churches, Gothic chapel of St. Mary, and the Neumünster church. The Marienberg fortress, which occupies the site of a Roman fort, stands on a hill overlooking the river on the left bank; till 1720 it was the episcopal palace. The new episcopal palace, now the royal palace, a splendid example of the rococo style, was built in 1720. The Julius hospital in the n.w. part of the city was called after Bishop Julius, who refounded the university in 1582. Würzburg became an episcopal city in the 8th century; in 1803 the bishopric was assigned to Bavaria. Pop. (1900) 75,499.

Wurzen, tn., kingdom of Saxony, Germany, on the Mulde, 16 m. E. of Leipzig, has an ancient castle and a 12th-century cathedral. Machinery, carpets, and biscuits are manufactured. Pop. (1900) 16,615.

Wu-sung, or WOO-SUNG, treaty port, China, prov. Kiang-su, on l. bk. of Hwang-po, at its junction with the Yang-tse-kiang. Lack of water on the bar (average, 19 ft. at spring tides) prevents men-of-war and vessels of deep draught from going up to Shanghai (12 m.). The forts were captured in 1842 by a British fleet; but in 1893, when Wu-sung was made a treaty port, the forts were dismantled.

Wuttke, HEINRICH (1818-76), German historian and politician, born at Brieg in Silesia, was appointed professor of history at Leipzig (1848), but took an active part in public affairs, being one of the founders of the 'Great German Party.' Among his works are *Die Schlesischen Stände* (1847); *Polen und Deutsche* (1847); *Die Völkerschlacht bei Leipzig* (1863); *Städtebuch des Landes Posen* (1864); and *Geschichte der Schrift und des Schrifttums*, of which only one volume appeared (1872-3).

Wuttke, KARL FRIEDRICH ADOLF (1819-70), German theologian, born at Breslau; became professor of theology in Berlin (1854), and Halle (1861). His principal works, all written in an orthodox spirit, are *Geschichte des Heidenthums in Beziehung auf Religion* (1851-3), *Handbuch der Christlichen Sittenlehre* (1861-2; Eng. trans. 1873), and *Ueber die Lehrfreiheit der Geistlichen* (1870).

Wyandots, N. American aborigines, a branch of the Hurons, who, in the 17th century, moved from Canada to the right bank of the Detroit R., Michigan, and thence ranged into Ohio. In 1832 they ceded their hunting-grounds to the United States government in exchange for some tracts about the Missouri-

Kansas confluence. In 1900 only 680 were still in the tribal state, distributed with the Hurons in Indian Territory, in Quebec, and in Ontario. The term Wyandot is often applied collectively to all the northern Iroquois tribes—Hurons, Eries, and others—who did not belong to the confederacy of the six nations, and were exterminated by them.

Wyandotte, tn., Wayne co., Michigan, U.S.A., on r. bk. of Detroit, 12 m. s.s.w. of Detroit; has iron shipbuilding, and manufactures of chemicals, salt, and trunks. Pop. (1900) 5,183.

Wyandotte Cave, in Crawford co., Indiana, U.S.A., 5 m. N.E. of Leavenworth, is 23 m. in length, the most notable division being the pillared palace, 350 ft. long and 250 ft. high.

Wyatt, JAMES (1746-1813), English architect, was born in Staffordshire, and became A.R.A. (1770). He quickly obtained a large practice as an architect, using first the Græco-Italian style, of which Henton House is a good example. He gradually turned to Gothic, and may be termed the reviver of Gothic architecture, although, owing to his activity as a restorer of cathedrals, he was called by archaeologists 'the destroyer.' Among his later works were Fonthill Abbey, Chiswick House, Dodding-ton Park, and Ashridge Castle.

Wyatt, SIR MATTHEW DIGBY (1820-1877), English architect and writer on art, was born near Devizes. After making the usual continental tour (1844-6), he published *Geometric Mosaics of the Middle Ages* (1848), and became secretary of the executive of the Great Exhibition (1851). He became Slade professor of architecture at Cambridge (1869). Among his works were Alford House, the Adelphi Theatre, London, the East India Museum; and among his writings *Metal Work and its Artistic Design* (1852), *Industrial Arts of the Nineteenth Century* (1853), and *The Art of Illuminating* (1860).

Wyatt, RICHARD JAMES (1795-1850), English sculptor, was born in London, and began to exhibit in 1818. His work attracted the attention of Canova (then on a visit to England), who invited him to Rome, where he settled and practised his art. Among his most notable works were *Ino and the Infant Bacchus*, *Musidora*, *Girl at the Bath*, and *Penelope*, which was commissioned by Queen Victoria.

Wyatt, SIR THOMAS (c. 1503-42), English poet and diplomatist, was born at Allington Castle, Kent. He is said to have been the lover, before Henry VIII., of Anne Boleyn. He held various offices at court, and was employed

diplomatically in France and Italy. He studied Petrarch, and introduced the sonnet to England. In 1536 he was imprisoned at the time of Anne Boleyn's disgrace, but was released and knighted. His Poems were published in *Tottel's Miscellany* (1557; ed. Arber, 1870); *Collected Poems* (ed. H. Nicolas, 1831). See Monograph, by R. Alscher, in German (1886); W. E. Simonds's *Sir Thomas Wyatt and his Poems* (1889).

Wyborg. See VIBORG.

Wych Elm. See ELM.

Wycherley, WILLIAM (1640-1715), English dramatist, was born at Clive, near Shrewsbury. Part of his early life was spent in aristocratic circles in France. In London he lived the life of a fashionable young man about town. In 1672 he produced the first of his plays, *Love in a Wood*, and immediately became the darling of the court and of society. He followed up his first success with *The Dancing Master* in 1673; but this piece failed to gain the same applause as its predecessor. In 1675 he brought out *The Country Wife*, and in 1677 his dramatic career ended with the production of *The Plain Dealer*. His first comedy was founded on a previous work of Sir Charles Sedley, and the last two plays on Molière, *The Country Wife* being based on *L'Ecole des Femmes*, and *The Plain Dealer* on *Le Misanthrope*. As an exponent of the restoration comedy, Wycherley ranks next to Congreve. His dialogue lacks the polish and the unremitting epigrammatic glitter that marks Congreve's work; but none of Congreve's comedies approach *The Plain Dealer* in character drawing. Of the indecency that the drama of the day delighted in, Wycherley had more than his full share. From an imprisonment for debt he was released by James II., who was a great admirer of *The Plain Dealer*. At the age of sixty-four Wycherley became acquainted with Pope, then sixteen years of age. See Leigh Hunt's edition of *The Works of Wycherley*, Congreve, Vanbrugh, and Farquhar (1840; reissued 1865); and the edition of *Wycherley* in the Mermaid Series, by W. C. Ward (1893); also Hazlitt in his *English Comic Writers* (1819).

Wycliffe, WYCLIF, or WICKLIFFE, JOHN (c. 1320-84), English religious reformer, is said to have been born at Hipswell, near Richmond in Yorkshire. In 1360 he became master of Balliol College, Oxford; but he soon resigned that post, and held in rapid succession the livings of Fillingham, Ludgershall, and Lutterworth (1374). He was sent as a commissioner to Bruges to consult with

the pope's envoys on ecclesiastical matters. His theory of dominion, and his attacks on the papal supremacy, made him popular among the Londoners; and his desire to reform the corruption of the clergy secured for him the support of the nobles, of John of Gaunt, and of the Prince of Wales. In 1377 John of Gaunt was supreme, and in order to secure popular sympathy he projected measures for the confiscation of church property. In retaliation Convocation decided to strike at John of Gaunt through Wycliffe, who was summoned in February 1377 to appear before a council of bishops at St. Paul's; but the council broke up in disorder. Forsaking the use of Latin, Wycliffe henceforward wrote in English. His writings were widely read; his translation of the Bible became very popular; and he organized a body of poor priests,



John Wycliffe.

who spread his teaching throughout the land. As the champion of national rights against the papacy, Wycliffe by the time of Wat Tyler's rebellion had become one of the most powerful men in England. He himself had no direct part in inspiring Wat Tyler's rebellion, but there is no doubt that his poor priests had a considerable if indirect share in organizing the movement. Moreover, Wycliffe's constant denunciations of the wealth of the church, his declaration of the unlawfulness of giving obedience to lay or clerical rulers if their lives were unrighteous, and his praise of poverty, helped to stir up men like John Ball, who sympathized with anarchy. After the suppression of the rising, a general reaction took place, and Wycliffe was attacked by the ec-

clesiastical authorities. Already in 1380 he had declared against the doctrine of transubstantiation, and his opinions had been condemned by the university of Oxford. In 1382 Archbishop Courtenay also condemned his opinions, and many of his followers were seized and persecuted. Wycliffe was not arrested, and during the next two years lived at Lutterworth. The main characteristic of his teaching was his repudiation of formalism and his insistence on inward religion. Anne of Bohemia, the first wife of Richard II., held Wycliffite opinions; and in Bohemia Wycliffe's writings were very popular among the followers of Hus. The University of Prague, however, condemned them, and they were burnt there, and articles from them were condemned by the Council of Constance and by Martin V. In England the Lollards, in spite of much persecution, carried on Wycliffe's teaching, and Lollardy, it is said, 'smouldered on till the reformation.' In 1428 Wycliffe's bones were dug up and thrown into the river Swift. His English *Works* were published in 1869-71 and 1880 (4 vols.), and his Latin *Opera*, in 17 vols. (1882-92). See G. M. Trevelyan's *England in the Age of Wycliffe* (1889), Loserth's *Wyclif and Hus* (1884), R. L. Poole's *Wycliffe* (1889).

Wycombe, HIGH WYCOMBE, or CHIPPING WYCOMBE, munic. bor., Bucks, England, 29 m. W.N.W. of London. Chair-making and cabinet works are the chief industries. Pop. (1901) 17,685.

Wye, riv., Wales and England, rises on Plinlimmon, flows E.S.E., E., and S. to the Severn estuary. It is famed for its beautiful scenery. Length, 130 m.

Wykeham, WILLIAM OF (1324-1404), chancellor of England, born at Wykeham, Hants. Edward III. appointed him guardian of several of his manors, and clerk of the works at Henley (1348). He was next created surveyor of the king's works at Windsor (1356), and erected the great quadrangle to the east of the keep (1359-69). In 1364 he was appointed keeper of the privy seal, and soon after principal secretary of state, while he was consecrated bishop of Winchester in 1367, and chancellor of England, an office he held the first time till 1371. He was thereafter chiefly occupied in founding two colleges — Winchester College (1387), and New College, Oxford (1380), to which Winchester College was to be the feeder. In 1376 he was accused of malversation of public funds, at the instigation of John of Gaunt, and was deprived of his offices. He was put on his trial, but the attitude

of the people became so threatening that it was deemed expedient to drop the proceedings. He then became closely connected with Richard II., and in May 1389, when the king declared himself of age, he appointed the bishop of Winchester chancellor, and the latter held the office till 1391. See *Lives* by Lowth (1758), Walcott (1852), and Moberley (1887).

Wyllie, WILLIAM LIONEL (1851), English artist, born at London, was the winner of the Turner medal (1869). In 1889 he was elected A.R.A., and in 1897 became R.A. His works comprise *London Water Gate*, *Barry Dock*, *The Liner's Escort*, and *Peace and Plenty*, besides others dealing with maritime subjects. He has written *Marine Painting* (1901), *Nature's Laws* (1903), *London to the Nore* (1905), and *Trafalgar* (1905).

Wyman, WALTER (1848), American surgeon-general (since 1902), born at St. Louis; has been in the marine hospital service since 1876. He has devoted great attention to the physical conditions affecting the seamen of the mercantile marine. In 1893 he had charge of the measures adopted by government for warding off cholera, and directs the administration of the national quarantine laws. He founded the first government sanatorium for consumption at Fort Stanton, New Mexico.

Wynants, or WIJNANTS, JAN (1615-79), chief representative of the Dutch school of landscape painting, born in Haarlem. Philip Wouwerman and Adriaen van de Velde were pupils of Wynants, and many works attributed to him are probably by Jan Wouwerman.

Wynberg, health resort, on S.E. slope of Table Mt., Cape Colony, 8 m. S.E. of Cape Town, is in a wine district (Constantia).

Wyndham, SIR CHARLES (1841), English actor; made his first appearance (1862) on the stage at Washington, U.S.A., playing with John Wilkes Booth. Returning to England he made his first London appearance (1865) in *All that Glitters is not Gold*. He returned to America (1869), and appeared at Wallack's theatre as Charles Surface, one of his greatest impersonations. It was at the Court Theatre, in 1874, that he made his first big hit in *Brighton*, a version of his brother-in-law's (Bronson Howard) *Saratoga*. He next took over the management of the Criterion Theatre (1876), where he has produced *Pink Dominoes*, *Truth, Betsy, Where's the Cat?*, *Butterfly Fever*, *Fourteen Days*, *Featherbrain*, *The Candidate*, *Wild Oats*, *Still Waters Run Deep*, *The Headless Man*, *David Garrick*, *She Stoops to Conquer*, and *The Bauble Shop*.

Wyndham, GEORGE (1863), English politician, born in London. In 1898 he succeeded Mr. Brodrick as under-secretary for war; on the reconstruction of Lord Salisbury's third ministry in November 1900, he was appointed chief secretary for Ireland. In July 1902, on the formation of Mr. Arthur Balfour's government, he was retained in this position, and admitted to the cabinet. In March 1905 he resigned on the ground that the MacDonnell controversy as to devolution had impaired his usefulness as a member of the government. He wrote *The Development of the State* (1904), and edited *The Poems of Shakespeare* (1898) and *North's 'Plu-*

Wynkyn de Worde. See WORDE.

Wyntoun, ANDREW OF (?1350-?1420), Scottish chronicler, was (1395) prior of St. Serf's Inch, Loch Leven. He wrote *The Orygynale Cronykyl of Scotland*, of value, historically, because of its relative accuracy; and philologically, as showing the close connection of the dialect of southern Scotland in the time of Wyntoun with that of northern England. The *Chronicle* was published by Macpherson in 1795, by Laing in 1872 (in *Scottish Historians Series*), and is being issued by the Scottish Text Society (bk. iv. 1906).

Wyoming, one of the western

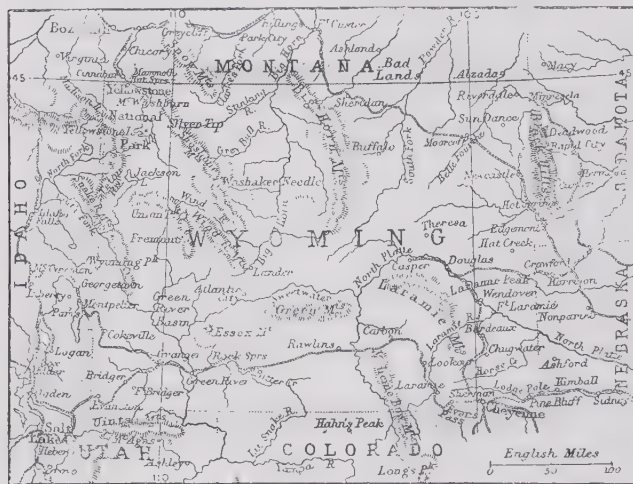
of the Green, Snake, Madison, Yellowstone, and Platte Rs. Except on its mountain ranges, Wyoming has a rainfall less than twenty inches annually. Irrigation is almost everywhere necessary. Farming consists in great part of pastoral pursuits. In the number of sheep the state is exceeded only by Montana. Manufactures are as yet of little moment, but in the mining of coal Wyoming is of great and increasing importance, the annual production being some 4,000,000 tons. Pop. (1900) 92,531, of whom the foreign-born constituted 19 per cent.; the proportion of urban population was 24 per cent. The chief cities are Cheyenne, the capital, and Laramie.

Wyoming Valley, picturesque valley, 23 m. long by 3 m. broad, along the N. branch of the Susquehanna, Luzerne co., N.E. Pennsylvania, U.S.A.; has deposits of anthracite coal. The massacre which forms the subject of Campbell's poem took place on July 3, 1778.

Wyss, JOHANN RUDOLF (1781-1830), Swiss man of letters, born at Bern, where he spent all his days as professor of practical philosophy and curator of the museum and library. He was the author of the *Swiss Family Robinson* (1812-13). He also edited a collection of Swiss legends and folklore tales (*Idyllen und Erzählungen aus der Schweiz*, 1815-22).

Wyttenbach, DANIEL ALBERT (1746-1820), classical scholar, born at Bern in Switzerland. Ruhnken invited him to Leyden (1770), and obtained for him a chair in the college of the Remonstrants at Amsterdam (1771), whence he was transferred to the University of Amsterdam (1779), and in 1799 to Leyden, as successor of Ruhnken, whose life he wrote in Latin (1800). His success as a teacher was very great, and he deserves to rank with Hemsterhuis, Valckenauer, and Ruhnken as an exponent of Dutch classical scholarship. He edited Plato's *Phaedo* (1810), and Plutarch's *Moralia* (1795-1820), also a few Greek texts, but his real work was done in the *Bibliotheca Critica* (1777-1808). See *Life* by Mahne (1823).

Wyvern, or WYVERN, in heraldry, a device representing a monster, whose fore part is that of a dragon with legs and wings, and whose hinder part is in the form of a serpent with barbed tail. See HERALDRY.



Wyoming.

turch' in the Tudor Classics. See DUNRAVEN.

Wyndham, ROBERT HENRY (1814-94), Irish actor, was born in Dublin, and made his first appearance on the stage at Salisbury (1836). In 1844 he was *jeune premier* at the Adelphi in Glasgow, and in 1845 made his début in Edinburgh, with which he was afterwards prominently associated as an actor-manager. Among his earlier parts were Mercutio, Charles Surface, and Rashleigh Osbaldistone in *Rob Roy*. He had the misfortune to have three theatres burned under his management. He retired from the stage in 1877.

of the United States of America, lying between lat. 41° and 45° N., and long. 104° and 111° W., with an area of 97,890 sq. m. It was organized as a territory in 1868, and admitted as a state in 1890. Most of the area is a plateau, with a mean altitude of 6,700 ft. Into the north-western part project ranges of the Rocky Mts., including the Teton and Wind River ranges, with peaks exceeding 13,000 ft. in altitude; and farther E. the Big Horn range, of nearly equal height. In the southern part of the state these ranges reappear as the Park, Medicine Bow, and Laramie ranges. It contains the sources

X

X. In some of the early Greek alphabets this sign has the value *ks*; in others its value is *χ*, spirant *k*. The value *ks* was transmitted to the Latin alphabet; the value *χ* was perpetuated in the standard Greek alphabet. It is possible that the sign had not the same origin in the two cases; in neither has the history of its origin been definitely established. *Samech* is conjectured to be the Semitic original of Latin *x*. *X* may have been differentiated from the Italian representative of *samech*, for the proper place of that letter is the fifteenth, and there was an obsolete sign in the fifteenth place of the early Italian alphabet. The form of early Semitic *samech* is that of Greek *Ξ*, with the addition of a connecting stroke down the middle. Hebrew *ש* is quite a transformation of the original. The name means 'support.' It is the same word as the Greek 'sigma.' The Greeks changed the name of *Ξ* when they changed its value. The name 'sigma' was in this way set free, and was transferred to the letter which the Semites called 'shin.' (See *S*.) The sound of *σ* is very unstable. In Latin it tended to become *s*. In English the letter is uncommon. It is sometimes pronounced *gz* ('example') and *z* at the beginning of words originally Greek (*Xenophon*). Other sounds also are represented by it in other modern alphabets—*c.g.* French and Spanish.

Xanthine, $C_5H_4N_4O_2$, a nitrogenous compound, closely allied to uric acid, that occurs in extract of meat and in tea. It forms a colourless powder slightly soluble in water, and yields alloxan and urea on oxidation.

Xanthippus, of Athens, father of Pericles; in 490 B.C. prosecuted Miltiades for his failure in the Parian expedition; in 484 he was ostracized, but was recalled when Xerxes invaded Greece in 480; and in 479 commanded the Athenians at the victory of Mycale. For some years subsequently he was one of the chief democratic politicians at Athens.

Xanthoxylum, a genus of shrubs and trees belonging to the order Rutaceæ. They bear cymes of usually small, white, or greenish flowers, followed by aromatic fleshy fruits. They mostly require greenhouse treatment in the British climate.

Xanthus, chief city of Lycia, stood on w. bk. of river of same name, 7 or 8 m. from its mouth. Twice in antiquity it endured sieges, which the inhabitants

ended by destroying themselves and their property—first by the Persians under Harpagus (545 B.C.), and secondly by the Romans under Brutus (43 B.C.). Its ruins were explored by Sir C. Fellows. See Fellows's *Discoveries in Lycia* (1841).

Xantippe. See *SOCRATES*.

Xavier, FRANCIS (1506–52), apostle of the Indies, was born near Sanguessa in the north of Spain. In 1534 he became associated with Loyola in the foundation of the Society of Jesus. John III. of Portugal sought for agents to go and Christianize the Portuguese colonies in India. Xavier was chosen, and landed at Goa on May 6, 1542. His first work was the revival of practical Christianity among the Europeans of Goa. His method was to teach the Creed, the Commandments, and the Lord's Prayer, and to baptize those who gave their assent to these formularies. Thirty churches were speedily organized near Cape Comorin. In Travancore Xavier baptized ten thousand of the natives. He then visited Malacca, the islands of Banda, Amboyna, and the Moluccas. In 1549 he landed in Japan, where he speedily won some adherents. At Amaguchi (Yamaguchi) he is said to have baptized no less than three thousand persons. Xavier then returned to Goa to plan a mission to China, but died of fever before he could carry out his purpose. He was canonized by Gregory xv. in 1622. His festival is on the 3rd of December. See *Life*, by H. J. Coleridge (1873).

Xebec, a small sharp-built, three-masted vessel, with lateen sails, used for coasting voyages in the Mediterranean and on the ocean coasts of Spain and Portugal. It differs from the felucca in possessing both square and lateen sails, the felucca having only the latter rig. The xebec was formerly much used by Algerine pirates.

Xenia, the changes produced in the seeds of some plants which have been fertilized with the pollen of another species or variety. In Professor Correns's experiments on different races of maize it was found that, when the yellow-skinned race was fertilized from plants of the race yielding violet-skinned grains, the pollen was prepotent, and a large proportion of the grains had a violet skin. See C. Correns's *Bastarde zwischen Maisrassen* (1901).

Xenia, city, Ohio, U.S.A., co. seat of Greene co., 50 m. N.E. of Cincinnati. Pop. (1900) 8,696.

Xenocrates (396–314 B.C.), of Chalcedon, Greek philosopher, was first a pupil of Æschines, and then of Plato, whom he accompanied (361) to Syracuse. He succeeded Speusippus as president of the Academy in 339 B.C. In philosophy, especially ethics, he followed Plato, though his theories as to number resembled Pythagorean doctrines. See Zeller's *Plato and the Older Academy* (Eng. trans. 1876).

Xenon, Xe, 128, is the heaviest and rarest of the elementary gases of the argon family present in the atmosphere, in which it occurs to the extent of about one part in twenty millions. It was discovered by Sir William Ramsay in the residue left on evaporating liquid air, and is chemically quite inert. When sparked in a vacuum tube it is marked by a characteristic blue glow, which changes to green on the introduction of a Leyden jar, and shows distinctive lines in the spectrum.

Xenophanes (c. 576–480 B.C.), of Colophon in Asia Minor, founder of the Eleatic philosophy; left Colophon at the age of twenty-five, and after years of travel in Greece settled at Velia (Elea) in S. Italy. He expressed his views in poetry, particularly noticeable in his condemnation of the anthropomorphism of Homer and Hesiod. His doctrine was that God is the One; that His existence is characterized by unity and immutability; and that the universe is permeated by this divine unity. His followers were Parmenides and Zeno. He wrote both elegiac poems and a work on nature in hexameter verse. For the extant fragments see Bergk's *Lyrici Græci* (ed. 1900), and for his philosophy Burnet's *Early Greek Philosophy* (1892) and Gomperz's *Griechische Denker* (Eng. trans. 1905).

Xenophon (c. 430–355 B.C.), Greek prose writer, was a native of Athens and a pupil of Socrates. In 401 B.C. he joined the expedition of Cyrus the Younger, and has told the story of it in his *Anabasis*. When the Greek officers were murdered through the treachery of the Persian satrap Tissaphernes, Xenophon brought the Greek troops safely to Trapezus (Trebizond), on the Black Sea. When they were taken into Lacedæmonian pay Xenophon left them, and returned to Athens. Soon afterwards he was banished, probably because of his Spartan sympathies. Eventually he settled at Scillus, near Olympia; but about twenty years later the Eleians expelled

him, and he retired to Corinth. In 369 his banishment was revoked. His historical works include the *Anabasis*, distinguished by the simplicity and candour of its style, the vividness of its pictures, and its fullness of detail (however, both its authenticity and historical value have been questioned, the latter not without reason); the *Hellenica*, which not only concludes Thucydides's history of the Peloponnesian war, but also deals with Greek history down to 362 B.C. (it is of great value, but shows a strong bias in favour of Sparta); and the *Agexilaus*, a panegyric on the Spartan king of that name. The works relating to Socrates are the *Memorabilia*, a defence of Socrates against his accusers, exhibiting the practical Socrates, not the ideal Socrates of Plato; the *Apology*, Xenophon's account of Socrates's defence at his trial; the *Economicus*, which gives Socrates's views on the practical business of life, especially on the relations and duties of husband and wife; and the *Symposium*, which describes a banquet at Athens, with Socrates as the central figure. The essays on political philosophy are a tractate, *On the Constitution of the Lacedaemonians*, which, however, rather describes the Spartan training; the *Hiero*, a dialogue between that ruler and the poet Simonides on tyranny; the *Cyropædia*, a sort of historical romance founded on the career of the great Cyrus; and the treatise *On Athenian Revenues*, a practical handling of the resources of the state, dating probably about 356. The work ascribed to Xenophon, *On the Athenian Constitution*, is clearly not his. Xenophon's technical tracts are three in number—the *Hipparchicus*, on the duties of a cavalry officer; *On the Horse*, remarkable for its practical sense and the humanity of the methods of training which it recommends; and *On Hunting*, which treats of the breeding and training of dogs, of nets, and of hare-hunting. As a writer, Xenophon is possessed of great charm. His chief merit is the simplicity and ease of his style, the vividness of his descriptions, and the dramatic naturalness of his dialogue; but he falls far short of the inspiration of Plato or the profundity and solidity of Thucydides. The language of his writings is Attic, but combined with a number of words from other Greek dialects, Ionian and Dorian. In fact,

he was the earliest writer of what is known as the 'common dialect' of Greek, which eventually spread over the Eastern world, and from which modern Greek is derived. Editions: Schneider (1838-40), Sauppe (1864), L. Dindorf (1873), Schenkl (1876); separate works, with notes, *Anabasis*, by Pretor (1888); *Cyropædia*, by Holden (1887-90); *Hellenica*, by Keller (1890), bks. i. and ii. by Underhill (1888); *Hiero*, by Holden (1883); *Memorabilia*, by Marshall (1890); *Economicus*, by Holden (1895); *Symposium*, by Winans (1881); English translation, by Dakyns (1890-4).

Xeres. See JEREZ DE LA FRONTERA.

Xerophytes. See PLANTS.

Xerxes, king of ancient Persia from 485 to 465 B.C., was the eldest son of Darius, whom he succeeded. Immediately upon his accession he began to make preparations for the invasion of Greece. Two of the greatest works performed were the cutting of a canal through the isthmus of Mt. Athos and the bridging of the Hellespont. Xerxes accompanied his forces on their march through Thrace, Thessaly, and Locris, witnessed the battle of Thermopylæ, then advanced through Phocis and Boeotia into Attica, and from the Attic coast beheld the destruction of his fleet at Salamis. He then retired with great speed into Asia (480 B.C.). In 465 he was murdered by two of the officers of his court; he was succeeded by his son Artaxerxes. See Grundy's *Great Persian War* (1901).

Ximenez de Cisneros, FRANCISCO (1436?-1517), Spanish cardinal and statesman, born at Torrelaguna, Castile. He lived in Rome as consistorial advocate (1464-72). When Ximenez took possession of the archpriesthood of Uceda, under the papal grant, he was imprisoned by the archbishop of Toledo, and remained in prison six years. Then he exchanged his benefice for that of canon-general of Sigüenza under Cardinal Mendoza, whose chaplain he was (1480). When Mendoza became archbishop of Toledo (1483) Ximenez followed him, and entered the Franciscan order. He was famous in the order for austerity and piety, and when, in 1492, Queen Isabella's confessor Talavera was made archbishop of Granada, Mendoza recommended Ximenez to succeed him. He was stern, bigoted, and strong, and his personal recti-

tude and piety gave him great influence over the queen. On the death of Mendoza (1495) she insisted upon making Ximenez archbishop of Toledo, in opposition to the wishes of Ferdinand and of Ximenez himself. He was a drastic ecclesiastical reformer, and reformed the scandalous corruption of the monastic orders. To Ximenez is mainly due the establishment of the Spanish Inquisition (of which he was chief) as a political force. Ximenez founded and splendidly endowed the University of Alcalá (1499-1508), and there established his famous study for translating, collating, and printing the great 'Complutensian' polyglot Bible. On Isabella's death (1504) Ximenez became chief minister to Philip I. and Juana, the new sovereigns of Castile, and is believed to have had a hand in Philip's death by poison in the next year (September 1506). He was made cardinal in 1507; but Ferdinand distrusted him, and during his absence upon an armed expedition to conquer N. Africa for Castile at his own expense he was disgraced, and retired to privacy at Alcalá (1509). On Ferdinand's death (1516) Ximenez again ruled Castile as regent, for nearly two years, for Charles I. The latter, as ungrateful as his grandfather, disgraced and dismissed his great minister on his arrival in Spain, and Ximenez died broken-hearted. See Gomez de Castro's *De Rebus Gestis Francisci Ximenii* (1569), and *Lives* by Hefele (Eng. trans. 1860), Ulrich (1883), and C. Navarro Rodrigo (1869).

Xisuthros. See DELUGE.

X Rays. See VACUUM TUBES.

Xylenes, or **XYLOLS**, the three isomeric dimethyl-benzenes, $C_6H_4(CH_3)_2$, occurring in coal tar. They are very similar to benzene, though of higher boiling-point (138-143° C.), and are used as the sources of some dye-stuffs.

Xylol. See XYLENES.

Xylonite. See CELLULOID.

Xylophaga, a general term for some groups of insects which bore into and feed on wood. See BORERS and WEEVIL.

X.Y.Z. Correspondence, a term applied in the history of the United States to a series of letters written to President Adams by three American commissioners who had been dispatched to France—Marshall, Pinckney, and Gerry—to secure the friendship of Talleyrand whose demands were altogether unacceptable.

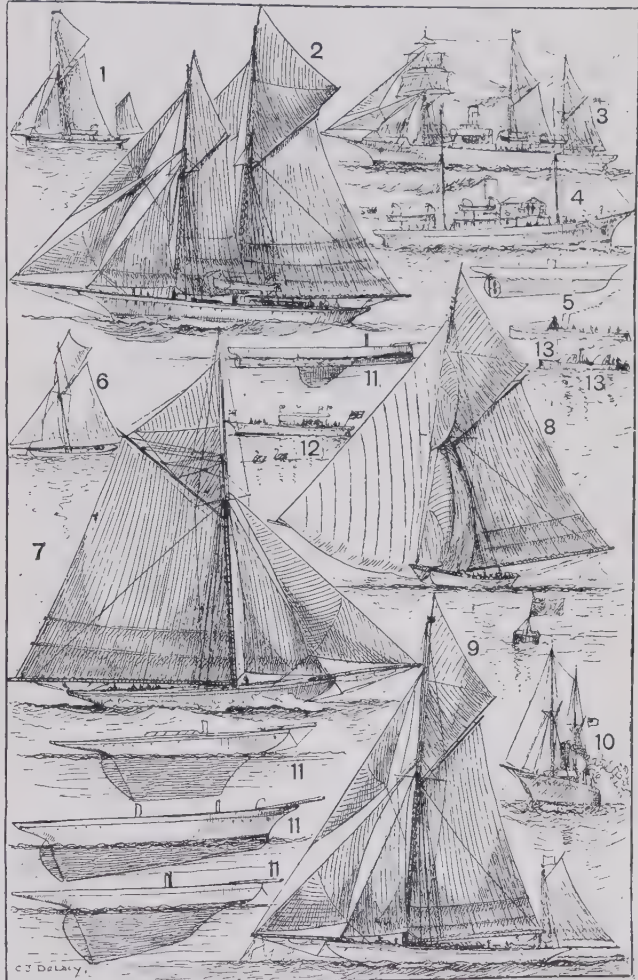
Y

Y. This letter is the Greek form of U. It was first adopted by the Latin alphabet in the form of V, with a distinctive Latin value. In the 1st century B.C. it was again borrowed, but this time for use in Greek words, in the form Y and with a Greek value. It is, therefore, properly a vowel. In Early English it had approximately the value of *u* in French 'lune.' After the Norman conquest, under French influence, *u* took the old value of *y*, and *y* became confused with *i*. As an English vowel *y* is now interchangeable with *i*, except that *y* is preferred at the end of words, and to represent Greek Y. The use of *y* as a consonant, as in 'yard,' is practically peculiar to English. It is here a substitute for *g*, owing to the resemblance of the written letters *g* and *y* (Ellis). (See G.) The English *y* has another consonantal value, now almost obsolete: it is occasionally used to express *th* (ye). In this case also it is a substitute for another sign, Early English þ. For the early history of *y*, see U.

Yacht. Yachting as a pastime may be said to date from 1720, when the Water Club of the harbour of Cork was founded; but not much progress was made until the foundation of the Royal Yacht Squadron in 1812. Popularity, however, came before 1843, when Queen Victoria took an interest in the sport by the offer of cups for competition. In 1846 yacht racing had secured a strong hold in the United States, and several new types of vessels were evolved. The yacht *America* crossed the Atlantic in 1851 to compete at Cowes, and in a race for a cup presented by the Royal Yacht Club was successful in transporting the cup to the United States, where it has since remained. (See AMERICA CUP.) Since then almost every year has seen improvements alike in design and build. Sailing yachts may be broadly divided into two classes—cruising and racing. The modern cruisers have been built specially with a view to comfort and good sea-going qualities. Many yacht-owners have built steam vessels, of very large power and dimensions, the recent ones having mostly twin screws and triple-expansion engines, and being capable of a speed of 16 or 17 knots. In the early days of yachting racing yachts were ordinary small coasting vessels; but the desire for speed led in time to the building of vessels specially adapted to this end. In order to put the various sized yachts on a

somewhat equal footing, measurement rules were adopted, and the design of a racing yacht immediately narrowed itself down to the question of getting the biggest possible boat on the smallest possible measurement.

large sail, heavy keels were fitted at a great depth, and the vessels had a very large displacement. But a new rule was introduced (1897), in which length and sail area alone were taken into account. The removal of the tax on



Types of Yacht.

1. Pleasure yacht for seaside passengers. 2. Schooner yacht. 3. Steam and sail cruiser. 4. Steam yacht, river and coasting. 5. Hull, showing screw. 6. Solent one-class yacht. 7. Racing cutter. 8. Same, full sail, showing spinnaker. 9. Yawl-rigged yacht. 10. Steam cruising yacht. 11. Hulls of various patterns of racing yacht. 12. Electric river launch. 13. Steam launches.

Under the old tonnage rule, where breadth was very heavily taxed and sail area not measured at all, the vessels were extremely narrow and had large sail-spread. To enable them to carry the

beam immediately caused vessels to become very much broader than they had been before. The type of vessel produced under this rule had large sail area, great breadth and draught, with the

smallest possible displacement, very hollow floors and long overhangs forward and aft, making her a very indifferent sea-boat, but undoubtedly fast in light and moderate weather. In order to correct this the present measurement rule has been introduced, which taxes any hollowiness of the floor or in the profile of the vessel. Some of the yachts which were built to compete for the America Cup were constructed of steel, with a lead keel run into the bottom of the vessel; others were of composite construction, having steel frames and wood planking. The rating rule under which these vessels are measured takes account only

at one time was typical of American vessels, both contestants having become keel cutters. Indeed, so like one another have the yachts become that the result of a contest is almost beyond the control of the designer or builder of the vessel—a slight error of seamanship or fluke in the weather making a far greater difference in the result than anything due to the design or construction of the yachts themselves. For other than racing purposes steam has now taken the place of sails in cruising yachts. See Clark's *History of Yachting* (1904), Smyth's *Mast and Sail in Europe and Asia* (1906), Young's *Yacht Manage-*

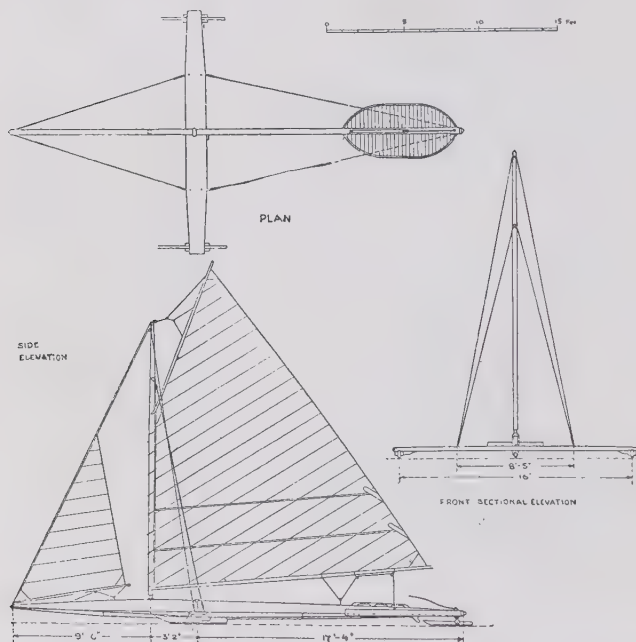
line, plus 4 times the difference between the chain girth and the true girth (this being to penalize hollow floors), plus 45 times the square root of the sail area and the sum divided by 2.1. All the above dimensions being taken in feet and decimals thereof, the result is a quantity expressed in feet. The rating rule under which the America Cup contests are carried on is length plus square root of sail area, divided by two, which again is a quantity of one dimension, all sizes being taken in feet and decimals thereof.

Yacht, ICE SAILING, a form of yachting practised chiefly on the ice of the Hudson R. in America, and on the Gulf of Finland. An ice yacht differs little from an ordinary yacht. The sails and manipulation are the same; but instead of having a keel, the ice yacht possesses what is called a 'runner plank'—either rigid or flexible—which runs athwart ship, and on which rests the whole superstructure. The bottom frame is in the form of a kite or cross—two strong timbers placed at right angles, with an after runner, which serves the double purpose of runner and rudder. Timber and bowsprit are trimmed down and firmly bolted together, forming the long backbone of the yacht. Upon the after end of the timber is fitted a shallow elliptical box, provided with cushions, upon which the helmsman and passengers sit or lie. The framework is held in position by four steel wire stays, running from the end of the bowsprit and centre timber to near the ends of the runner plank, starboard and port. A fully-equipped ice yacht in a good wind can do a mile in a minute.

Yahveh, or JAHVEH. See JEHOVAH.

Yājñavalkya, Hindu sage, founder of the Vajasaneyins, or White Yajus, and the author of the *Satapatha-brāhmana*. He spent some time at the court of King Janaka of Videha (Tirhut)—i.e. Muzaffarpur in Bengal. He wrote also the *Yājñavalkya Dharmaśāstra* (ed. with German trans. by Stenzler, 1849), a treatise on law, consisting of three books—the rule of conduct, the civil and criminal law, and penance or expiation.

Yak (*Bos grunniens*), a member of the ox genus, found on the high plateau of Tibet, and in the neighbouring parts of Central Asia, where it occurs alike as a domesticated and as a wild animal. The most notable peculiarity is the heavy fringe of long hair which occurs at the sides of the body, extending up to the shoulders in front and over the thighs behind. The tail also bears an enormous tuft of long



The Construction of an Ice Yacht.

of length and of sail area, so that the vessels are generally of the type evolved under the old British rule in respect to the hollow floor and long overhangs, with considerable breadth and draught. The length (for cutters) is limited by the rule to 90 ft. The vessels being designed purely to obtain the maximum speed, weight has been cut down as far as is consistent with the necessary strength. This has been done by employing nickel steel, tobin bronze, manganese bronze, plough steel wire (for rigging), while the ballast is invariably of lead. A noticeable feature of this contest is an entire disappearance of the centre-board, which

ment (1904), Kemp's *Yacht Sailing* (1904), and Stephen's *American Yachting* (1904).

Measurement Rules.—The early measurement rules involved the product of length multiplied by square of breadth, giving a volume or quantity of three dimensions, and generally expressed in units called tons. When sail area was introduced as a factor, together with the length of the vessel, the rating became a linear or 'one dimension' quantity, and was most conveniently expressed in feet. The present Y.R.A. rating rule is length on water-line plus breadth, plus 75 times the chain girth taken at 6' of the length from fore end of water-

hair, and there is a similar tuft on the breast. The wild yak is dark brown in colour, and an average bull stands 5 ft. 6 in. at the shoulders; but in domestication there is much variation as regards colour, size, and the texture of the coat. The domesticated form is kept for the sake of its milk and flesh, and also on account of its use as a beast of burden. Very intolerant of heat, the wild yak is very resistant to cold, and is found in the summer time at altitudes of from 14,000 to 20,000 ft. above sea-level. It is very shy and wary, but at bay is a dangerous adversary. The body is massive, the legs short, the horns very large in the bull; the voice is a grunt. In certain peculiarities of structure the yak seems to approach the bison more nearly than the true oxen.

Yakub Beg. See KASHGAR and TURKESTAN (CHINESE).

Yakub Khan. See AFGHANISTAN.

Yakuts, a Ural-Altaic people of the Turki stock, inhabiting the Siberian province of Yakutsk, and numbering 244,183 in 1897. To some extent they are nomadic, but their usual dwelling is the wooden *yurt*, with sloping, turf-clad walls. For more than a century they have been nominally members of the Orthodox Greek Church; but as a matter of fact they are still Shamanists. They live in communities or scattered groups, and are strictly exogamous, a marriage between two people of the same group being almost quite unknown. It is believed, however, that endogamy was the rule among them in ancient times. Sieroshevski, a Polish exile, who spent twelve years among the Yakuts, gives an exhaustive account of these people (*Yakuty*, 1896), an English abridgment of which was contributed by Professor Sumner of Yale to the *Journal of the Anthropological Institute of Great Britain and Ireland* (1901). See also J. Stadling's *Through Siberia* (1901).

Yakutsk. (1.) Province, Siberia, extends from the Anabara R. on the w. to the Stanovoi range on the e., and southwards to the Vitim R. and the Yablonoi range. From the Stanovoi range, which in its southern part exceeds 7,500 ft., the country sinks northwards to the Arctic Ocean in the form of plateaus and ranges of mountains separating the river valleys. Of these rivers the Lena is by far the largest. East of it lie the Yana, Indighirka, and Kolyma; westwards, the Olenek and Anabara. Lakes are very numerous, especially in the plain between the Indighirka and Kolyma. Forest covers a large part of the surface, extending up to 69° or 70°, and leaving a strip of tundra along

the shore of the ocean. The climate is of remarkable severity, lower temperatures being recorded (down to -76° F.) at Verkhoyansk than were experienced by Nansen in the Polar regions, and the ground being always frozen to a depth of three or four feet. Nevertheless, and in spite of the small precipitation—the

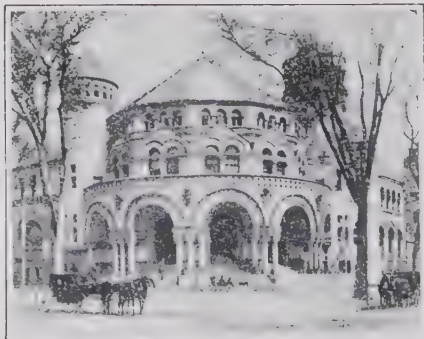
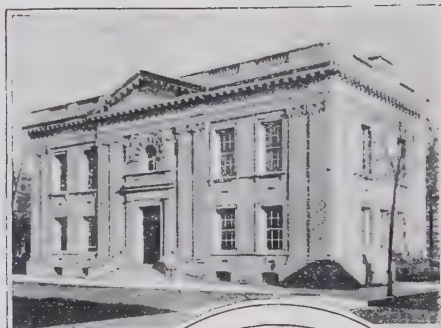
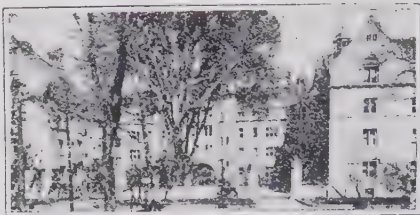
tusks. The sable has been nearly exterminated, and the skins now obtained are chiefly squirrel, ermine, and fox. Gold is extracted principally from the placers of the Olekma and Vitim. Coal is found near Shigansk on the Lena, and there are seams on the Vilyu and Kolyma; galena, copper, and iron also exist. Ya-



Yakut Types.

summer rainfall not exceeding eight inches—cereals are grown, chiefly rye and barley. Cattle-grazing and horse-breeding are the chief occupations of the settled inhabitants in the south—Yakuts and Russian settlers—while the Tunguses and Chukches possess herds of reindeer, hunt, fish, and collect mammoths'

kutsk is the chief town. Area, 1,533,400 sq. m. Pop. (1897) 261,731. (2.) Town, cap. of above prov., Siberia, 1,150 m. N.E. of Irkutsk, on l. bk. of Lena. It consists chiefly of houses of wood or mud, built on a marshy alluvial plain. It is a convict station, and the residence of the bishop of Yakutsk and Vilyuisk. Pop. (1897) 6,534.



Views in Yale University.

1. Vanderbilt Hall. 2. Durfee Chapel. 3. Sheff-Vanderbilt Dormitory. 4. Beyen Hall. 5. Administration Building. 6. Sheff Row.
7. Asborne Hall. 8. Old Yale Fence.

Yale, ELIHU (1648-1721), governor of Madras, was born near Boston, Massachusetts, but was brought to England in 1652. In 1672 he entered the service of the East India Company, and became governor of Madras (1687-92). He was suspended in 1692 because of high-handed conduct, but was made governor of the East India Company in 1699. In 1718 he helped to endow the college (now university) which bears his name. He also left to it a large sum of money.

Yale University, an institution in the United States, chartered as the Collegiate School of Connecticut in 1701. The college was first established at Saybrook, but was removed to New Haven in 1717, and the name of Yale College was adopted in honour of Elihu Yale, who had made large gifts to the school. A new charter was obtained in 1745, and in 1887 the title of Yale University was authorized by the legislature. In addition to the academic department, Yale has schools of philosophy, of medicine (founded 1812), of theology (Congregational, founded 1822), of law (1824), the Peabody Museum of Natural History, the Sheffield Science School (1847), and the School of Fine Arts (1864). The library contains (1905) 350,000 volumes. The students (1905) numbered 3,138.

Yalta (anc. *Yalta*), seapt, and winter resort, Taurida prov., in the Crimea, Russia, 61 m. E.S.E. of Sebastopol, on S. slope of Yaila Mts. Mean temp. of year, 57° F. Pop. (1897) 13,269.

Yalu, riv., Korea, rises in Paiktu-san, falls into Korea Bay, its course forming the boundary between Korea and Manchuria. Rich forests clothe the mountains in its upper basin; large quantities of timber are floated down to Wi-ju, and thence shipped to China. The river is navigable to Wi-ju. For the battle of Yalu see HAI-YUN-TAU and RUSSO-JAPANESE WAR.

Yam, the name given to certain tropical plants belonging to the genus *Dioscorea*. They are extensively cultivated in China and in the W. Indies. They are grown for their roots or rhizomes, which are cooked and eaten as a vegetable. *D. batatas* is difficult to grow, as its roots go so deep into the soil. Its thin, trailing stems attain a height of from six to nine feet, the growth being not unlike that of the black bryony of British hedges. The rhizomes of *D. decaisneana* are more like potato tubers, and they do not require so deep a soil. This last was introduced into France in 1854, and it is also largely grown in S. Africa. Reproduction is from the tubers. These produce their trailing stems,

which, when strong enough, are made into cuttings and planted in ridges. There are several varieties of Chinese yams. A trench from 10 to 15 ft. long will often produce enough roots to keep one man a whole year. The plants are also propagated from seed. The tubers average from fourteen to twenty inches long. Having been peeled and washed, yams may be boiled as potatoes; or they may be baked in a hot oven.



Yam (*Dioscorea batatas*).

1, Male; 2, female; 3, tubers; 4, female flower; 5, male flower.

Yama, in Hindu mythology, the god of the dead, who judges and punishes souls. He is represented as of a green colour, four-armed, clad in garments of fire, crowned, and seated on a buffalo. He holds a mace and noose, and drags the souls of the condemned out of their bodies to the judgment-seat. In the *Atharva-Veda* and *Rig-Veda* he is represented as the first mortal to die, and as thus showing to men the road to the other world.

Yamagata, ARITOMO, MARQUIS (1838), Japanese marshal and statesman, president of the Privy Council (1893). After the civil war in Choshi, in which he commanded the troops in the province of Echigo, he visited Europe (1870), and on his return to Japan advocated universal military service. To him is due the completion of the organization of the Japanese army, of which he is now chief of the general staff. In the war with China (1894-5) he was appointed to the command of the First Army Corps, and obtained a decisive victory at Ping-yang, and was about to march on Mukden, when he had to return to Hiroshima on account of ill health. He was created marshal and marshal of the empire. In 1906 he received the Order of Merit from King Edward.

Yanaon, French enclave in E. Madras, India, on l. bk. of Godavari, near its mouth, 83 m. N.E. of Masulipatam; covers an area of 3½ sq. m. Pop. (1903) 4,702.

Yanbu, or YEMBO, seapt, of Hejaz, Arabia, on Red Sea, 125 m. W.S.W. of Medina, of which it is the port. Pop. 5,000.

Yang-tse-kiang, riv., China, is estimated to drain a basin of 680,000 sq. m., and to discharge 770,000 cub. ft. of water per second into the Yellow Sea. Its length is estimated at nearly 3,500 m. Its sources lie a considerable distance apart, in lat. 33°-36° and long. 90° E., between the Tang-la and Kuenlun Mts. There the Murui-usu and the Chumar or Naphitai-ulan-muren unite in lat. 34° 43', alt. 13,146 ft., and form the Dichu or Drechu, which bends S.E. through deep gorges; below Batang, as the Kin-sha-kiang, or River of Golden Sand, it is the boundary between Tibet and China. Above Li-kiang it turns sharply N.E. to Yun-ning, and after describing almost a complete circle descends close to lat. 26°, and then turns N.E., receives the Ya-lung on its l. bk., and follows a course deep in the mountains, until at Ping-shan it at last leaves the ravines for a while and (1,726 m. from Shanghai) becomes a navigable river. On the left the Min, Lo, and Kia-ling, on the right the Heng, Chi-shin, and Kien-kiang add their waters before, near Kuei-fu, it enters the last series of gorges. Quitting these above Chang, it receives through the Tung-ting Lake the drainage of the province of Hu-nan, and at Hankow, to which ocean steamers ascend in summer, the waters of half of the provinces of Shen-si and Hu-peh, and enters an alluvial plain. Below Kiu-kiang the Poyang Lake empties into it the waters of the Kiang-si. In An-hui it becomes a tidal river, and in Kiang-su forms the chief strand in the network of canals. There is no good authority for styling it the 'son of the ocean,' or for the use of the French name 'Fleuve Bleu,' as fancifully explained by Réclus. See Blakiston's *Upper Yangtse* (1865); Carles, in *Geographical Journal* (Sept. 1898); and Mrs. Bishop's (Bird) *The Yangtse and Beyond* (1899).

Yanina. See JANINA.

Yankee, said to be an Indian corruption of English or Anglais. It was derisively applied by the British soldiers to the New Englanders during the revolutionary war (1775-82), and later by the Confederates to the Federals during the civil war (1861-5). The word is now indiscriminately used in Europe to denote the people of the United States.

Yankee Doodle, an American national air. It is generally considered to be an English tune introduced into America by the British troops about 1775, the words of which were written by Dr. Schuckburgh, a surgeon in the army of Lord Amherst during the French and Indian wars (1755-63). The air was first printed in Arnold's opera, *Two to One*, in 1784.

Yankton, city, S. Dakota, U.S.A., co. seat of Yankton co., on l. bk. of Missouri, 60 m. N.W. of Sioux city. Pop. (1900) 4,125.

Yapock. See CHIRONECTES.

Yapura, JAPURA, or CAQUETA, riv., Colombia and Brazil, S. America, rises in the Andes, near Popayan, and flows E.S.E. and S.E. 1,700 m. to join the Amazon on the left bank. It is navigable by steamers for 970 m.

Yard, the British standard of

of arable land, and the variation probably arises from the fact that in early times land was measured more by quality than by extent.

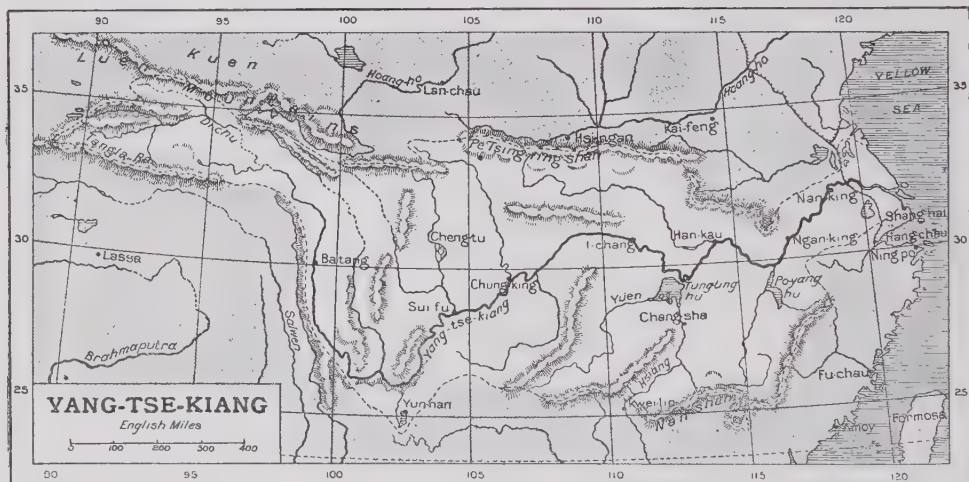
Yarkand, tn., cap. of E. Turkestan, Asia, on the Yarkand Daria, 106 m. S.E. of Kashgar; is surrounded by walls. It is the chief trading centre with N. India across the Karakoram Pass. The 'new town' and fort of Yanghi-shahr is in the N.W. of the town. Pop. (Sven Hedin's estimate in 1900) 100,000 (mainly Mohammedans).

Yarkand Daria, riv. of Eastern or Chinese Turkestan, forming the chief head-water of the Tarim. Its ultimate sources rise on the N. side of the Karakoram range; its course is first N.W., then N. and N.E. until it enters the plains of Kashgaria, after a 200 miles' struggle through the western Kuenlun Mts. In

a southern suburb, is now part of the co. bor. of Great Yarmouth. Pop. (1901) 51,316. (2.) Town, seapt., and yachting station, Isle of Wight, 10½ m. W. of Newport. Pop. (1901) 948. (3.) Seaport tn., Nova Scotia, Canada, on Atlantic coast, 135 m. S.W. of Halifax. It is the chief shipbuilding centre in Nova Scotia. Pop. (1901) 6,430.

Yarns, COUNTING OR GRISTING OF, the method of determining the dimensions, diameter, or weight of a thread. The following systems are those most generally in use.

Cotton.—Single yarns are based upon the number of hanks of 840 yds. each contained in 1 lb. (avoir.) or 7,000 grs. (troy). The hank of 840 yds. is reeled from the cop or ring bobbin after spinning. Thus, if in the gray state 30 hanks weighed 1 lb., it would be called 30 counts ($30 \times 840 =$



measure, equal to three feet or thirty-six inches. The exact measure is indicated by the length between two marks on a metal rod embedded in the masonry of the Houses of Parliament, and of the Royal Observatory, Greenwich, a copy being also held in the Standards Office. Chisholm, the warden of the standards, traced the yard back to the Egyptians and Hebrews. As a clth measure the yard is divided into four quarters, or sixteen nails. A square yard contains nine square feet, and a cubic yard twenty-seven cubic feet. A yard equals 91'4392 square centimetres, a square yard 8361'13 square centimetres, and a cubic yard 764,535 centimetres.

Yardland, or VIRGATE, an old English measure of land, varying from 10 to 30 or 40 acres. It was the normal holding of a tenant

the lowlands it flows N.E. by Yarkand to its junction with the Kashgar Daria, Khotan Daria, and Ak-su, after which the united river must be considered as the Tarim. Its length is fully 600 m.

Yarmouth, or GREAT YARMOUTH. (1.) Municipal, parl., and co. bor., seapt. and wat.-pl., Norfolk, England, on the Denes, a narrow peninsula at the mouth of the Yare. It extends for about 3½ m. along the shore. There are two piers, marine parade (3½ m.), ornamental gardens and recreation grounds, etc. The church of St. Nicholas is ancient. The 13th-century refectory of St. Nicholas Priory is now a school. Yarmouth is a centre of the herring and other fisheries. Ship and boat building are carried on. On N. Denes are excellent golf links, and on S. Denes a monument to Lord Nelson. Gorleston,

25,200 yds. in 1 lb.). A small percentage of moisture in the yarn over the natural moisture is allowed. When two or more threads are doubled or twisted together, the yarn is spoken of as twofold or threefold, and the hanks per lb. are reduced in proportion to the folding or number of threads twisted. The method of denoting folded yarns is as follows:—Two threads of 60's folded would be written thus, 2/60; three threads of 60's folded, 3/60; and so on, equalling 30 and 20 hanks to the lb. respectively. Bump yarn or coarse counts below 2's are based upon the yards in one ounce—90 yds. bump means 90 yds. to 1 oz. A bundle of gray cotton yarn weighs 10 lbs.

Linen counts are based upon the number of leas of 300 yds. contained in 1 lb. A bundle of linen contains 200 leas.

Woolens.—The following are some of the principal systems:—Leeds and Huddersfield, by the number of yds. in 1 dram—for example, 20's skein wool, meaning 20 yds. of 1 thread, weighs 1 dram. Dewsbury is by the number of yards in 1 oz.; west of England by the number of times 20 yds. is contained in 1 oz.; Galashiels by the number of cuts of 300 yds. each in 24 oz. or 384 drams; Hawick by the cuts of 300 yds. each in 26 oz. In America the run and cut system is adopted mostly. The run is based upon 100 yds. per oz., or 1,600 yds. to 1 lb.: thus, 200 yds. weighing 1 oz. would be called two-run yarn. The cut is based upon 300 yds. to 1 lb.; two-cut yarn=600 yds. to 1 lb.

Worsted counts are based upon number of hanks of 560 yds. to the lb. The system of counting doubled yarns is the same as with cotton, the difference being in the length of hank only.

Silk.—Spun silk, which is usually two or more fold, is also based upon the number of hanks of 840 yds. to the lb., like cotton. The only difference is in the doubled yarns. Whereas in cotton the hanks per lb. of cotton are reduced exactly in proportion to the threads folded, in silk the hanks per lb. are exactly as stated: for example, 80's twofold, written 80/2, would mean 80 hanks per lb.; only in the doubling process two threads of 160 would be twisted together.

Raw silk systems of counting are various. One method is the number of drams a 1,000 yd. hank weighs—four-dram silk=weight of 1,000 yd. hank. Another is the denier system, by the number of deniers contained in 1 hank. The denier is a doubtful quantity, it being given as 20 = to 16½ grs., and sometimes 32 to a dram. See Brooks's *Weaving Calculations* (1889), and Ashenhurst's *Textile Calculations* (1893).

Yarosslavi, city and archiepiscopal see, cap. of Central Russian gov. of same name, on Volga, 155 m. N.N.E. of Moscow; has manufactures of cotton, tobacco, and flour. The cathedral dates from early in the 13th century. Yaroslavl was the capital of an independent principality from 1026 to 1471. Pop. (1897) 70,610.

Yarrell, WILLIAM (1784-1856), English naturalist, carried on his father's business as a newsagent, but published *History of British Fishes* (2 vols. 1836) and *History of British Birds* (3 vols. 1843). These embodied accurate descriptions, with woodcuts, of every species of fish and bird native to Britain, and are standard works. The former was republished in 1859 (3rd ed.), the latter in 1881-

85 (4th ed.). See Memoir by Van Voorst, prefixed to *British Fishes* (1859).

Yarrow, classic Scottish stream, rises on the watershed between the counties of Peebles, Selkirk, and Dumfries, and flows to St. Mary's Loch. After issuing from this it flows mainly N.E. to join the Ettrick on the l. bk. in a beautifully wooded valley two miles from Selkirk, after a course of twenty-five miles. Though the valley, especially in the upper reaches, is pastoral, it has a certain fascination, which is strengthened by its ballad literature and the writings of Hamilton, Hogg, Scott, Wordsworth, Shairp, Bolland, and others.

Yarrow. See **ACHILLEA**.

Yass, tn., New South Wales, Australia, on riv. Yass, 190 m. S.W. of Sydney. Pop. (1901) 2,224.

Yassy. See **JASSY**.

Yate, ARTHUR CAMPBELL (1853). He served through the Afghan war (1879-80), on the Afghan Boundary Commission (1884-5), in Burma (1886-8), and has travelled extensively in Persia and Russian Central Asia. Among his books are *England and Russia Face to Face in Asia* (1886), *John Houghton* (1900), and *The Army and the Press* (1901).

Yates, EDMUND HODGSON (1831-94), English journalist and novelist, was born at Edinburgh; entered the General Post Office in 1847, and from 1862-72 was head of the missing-letter department. He edited successively *Town Talk* (1858), *Temple Bar* (1860-7), *Tinsley's Magazine* (1867-74), and *Time* (1879-83). In 1874 he founded a weekly periodical, the *World*, which met with marked success as a society paper. Yates wrote some novels—*Broken to Harness* (1864), *Kissing the Rod* (1866), and *Black Sheep* (1867). In 1885 he was imprisoned for a libel on Lord Lonsdale. See his *Recollections and Experiences* (1884-5).

Yawl. See **SAILS AND RIGGING**.

Yawning, a prolonged deep inspiration following successive attempts at numerous inspirations, the mouth, fauces, and glottis being widely open and the lower jaw depressed. The succeeding expiration is shorter, and both acts are usually accompanied by prolonged characteristic sounds. Yawning is involuntary, and is generally caused by drowsiness, ennui, or fatigue; but it may be induced by the sight of another person yawning.

Yaws, or **FRAMBESIA**, a disease peculiar to the negro. It is epidemic, and is communicable by actual contact and by inoculation. It is characterized by the development of yellowish or reddish-yellow tubercles, which

gradually form a moist exuding fungus over the skin, without constitutional symptoms except the debility which follows ulceration and continued discharge. The disease usually continues from two to four months, but may extend over several years. Absolute cleanliness is essential for a cure, and the patient should have generous diet. Locally, carbolic lotions and mercurial ointments should be applied.

Yeadon, par., W. Riding, Yorkshire, England, 4 m. S. of Otley; has extensive woollen manufactures. Pop. (1901) 7,059.

Year, the period of the earth's revolution round the sun. Three kinds are distinguished—the sidereal, the anomalistic, and the tropical. The sidereal year consists of 365 dys. 6 hrs. 9 min. 9 sec. It strictly measures the time of one terrestrial circuit in space. The anomalistic year, or the interval between two successive passages of perihelion by the earth, is, by the progressive movement of the terrestrial line of apsides, rendered 44 min. longer than the sidereal year, and comprises 365 dys. 6 hrs. 13 min. 48 sec. It is used only in calculations of perturbative effects. The length of the tropical year, 365 dys. 5 hrs. 48 min. 45½ sec., is the lapse of time from one vernal equinox to the next. Its comparative shortness is caused by the precessional westward shift of the equinoctial point. It is the year of civil life and of chronological reckoning. Tropical years are divided into 12 calendar months, as follows: January, 31 days; February, 28 or 29 days; March, 31 days; April, 30 days; May, 31 days; June, 30 days; July, 31 days; August, 31 days; September, 30 days; October, 31 days; November, 30 days; December, 31 days. These designations are of Latin origin. January, established as the first month in 46 B.C., was sacred to the god Janus. February was called from Februa, a festival of purification celebrated on the 15th of that month. March, from the god Mars; April, from *aperire*, 'to open,' the earth then 'opening' to produce fruit. May was dedicated to the goddess Maia. June took its name from the Junian gens or family. July and August were appropriated respectively by Julius and Augustus Cæsar. They had previously been entitled Quintilis and Sextilis, as being the fifth and sixth from March, the primitive first month. September, October, November, and December indicate the ancient order of succession (seven, eight, nine, and ten). The days of the months sum up normally to 365, while the year is about 365½ days. The intro-

duction of quadrennial 'leap years,' in which February has 29 days, somewhat overcorrects the inequality; hence the Gregorian calendar added a counter-rectification by dropping from the series of leap years such century years as are not divisible by 400. Thus, 1700, 1800, and 1900 were years of 365 days; but 2000 and 2400 will each contain 366 days. (See further under CALENDAR.) Down to 1752 the legal New Year's Day in England was on March 25. In most civilized countries the year now begins at midnight on December 31. The Chinese year probably opened originally at the winter solstice, while in Babylonia the first day coincided with the spring equinox. Both cycles were 'luni-solar'—that is, the sun and moon concurred to regulate them. They had a normal complement of twelve lunations, extended to thirteen about once in three years, so as to fill the due measure of 365 days. The Jews still employ such a system. Their years are arranged in cycles of 19—the 3rd, 6th, 8th, 11th, 14th, 17th, and 19th years in which, termed 'embolismic,' include 13, the intermediate 'ordinary' years 12 months each. Until the middle of the 18th century, indeed, a simple lunar year of 354 days was in use, modified only so far as to secure its beginning at new moon. The Mohammedan year is similarly independent of the sun. It comprises 12 months alternately of 29 days and of 30 days, supplemented by the addition of a day each to 11 years out of 30. The beginning of these years evidently retrogrades rapidly through the seasons. This was also, though in a less degree, the case with the Egyptian 'vague year' of 365 days. It made a complete circuit in the 'Sothic period' of 1,461 solar years. A fixed year, beginning August 29, and corrected by the quadrennial intercalation of a day, was substituted for it about 233 B.C. The Vedic year was *luni-solar*; it was counted from the first new moon following the approximate entry of the sun into Aries (E. Plunket, *Ancient Calendars*, p. 142). The modern Hindus reckon from the new moon preceding the arrival of the sun at the initial point of the lunar zodiac, near the two chief stars of Aries (*ibid.* p. 136). Greek and Latin time reckonings were finally regularized by the Julian reform. The ecclesiastical calendar adopted in all Roman Catholic and in most Protestant countries is partly regulated by the solar and partly by the lunar year, thus giving rise to the distinction between movable and immovable feasts. See CALENDAR.

Yeast, the name given to a family of micro-organisms, the Sacccharomyces, that are instrumental in bringing about the alcoholic fermentation of sugar. The most useful variety of the family is *S. cerevisia*, which occurs in two forms that produce what is known as 'top' and 'bottom' fermentation, utilized in the manufacture of English and German beer respectively. *S. pastorianus* and *S. ellipsoideus* are the main cause of the fermentation of grape and fruit juice to form wine. In general the yeast plant consists of a number of microscopic round or oval cells, which often form branching chains. Yeast only grows satisfactorily when (1) in a watery medium containing a fermentable sugar; (2) in the presence of a suitable proportion of nitrogenous and mineral matter—such as phosphates, potash, lime, etc.—that is required in the building up of their structure; (3) at a suitable temperature, best at about blood heat; and (4) as long as the alcohol produced by



Yeast.

1, Isolated cell; 2, cell budding; 3, chain of cells resulting from budding; 4, cell reproducing by spores.

their action does not exceed about 15 per cent. Fermentation only takes place with growing cells. Yeast is also unable to ferment cane sugar or malt sugar directly, though it contains an enzyme which is capable of inverting these sugars, or converting them into levulose and dextrose, which are fermentable. The latter sugars decompose into alcohol and carbon dioxide. Although alcohol is the chief product sought in fermentation by yeast, it is the carbon dioxide that is utilized when yeast (barm) is employed in bread-making, the gas blowing out the dough into a light and spongy form. Yeast can be separated from the liquor, pressed, and even dried, without destroying its vitality.

Yeats, WILLIAM BUTLER (1865), Irish poet, born in Dublin, is the most distinguished representative of the contemporary Irish literary revival. He is superintendent of the Irish Literary Theatre, and writes and lectures. In 1904 he paid a visit to the United States. His *Wanderings of Oisín, and Other Poems* (1889) gave him a place as a poet of individual vision and individual music. Every volume of verse since, including the poetic dramas *The Countess Cathleen*, *The Land of Heart's*

Desire, and *Cathleen ni Hoolihan*, has added to Mr. Yeats's reputation as a master of subtle verbal music, and as a poet of an intense and vivid imagination. On the other hand, it cannot be said that anything in the lovely dramatic poem *The Shadowy Waters*, in *The Wind among the Reeds*, or *In the Seven Woods*, has fulfilled the promise of his first book. More marked has been Mr. Yeats's development as a prose writer since his *Celtic Twilight* of 1893. The short romances of *The Secret Rose*, the essays of *Ideas of Good and Evil*, reveal prose as delicate and as subtle as any written at the present hour. The play, *Where there is Nothing* was published in 1903, and several others have followed (*Plays for an Irish Theatre*, 1904, etc.). Mr. Yeats has also edited several reprints and anthologies—e.g. the 3 vol. ed. (in collaboration with Mr. E. J. Ellis) of the works of William Blake (1904).

Yecla, city, prov. Murcia, Spain, 42 m. N. of Murcia, an ancient Roman and Arabic city, with many ancient ruins. Pop. (1900) 18,743.

Yedo, the name applied till 1868 to Tokyo, Japan.

Yegorievsk, tn., Ryazan gov., Middle Russia, 60 m. N.W. of Ryazan; has manufactures of cotton. Pop. (1897) 23,932.

Yeisk, port in Kuban gov., Caucasus, Russia, on bay of same name, on E. coast of Sea of Azov; exports grain. Pop. (1897) 35,446.

Yekaterinodar, tn., cap. of Kuban prov., Caucasus, Russia, on r. bk. of Kuban, 155 m. S.S.W. of Rostov-on-Don; has fruit gardens, and a large trade in corn and flour; also a cathedral; and is the residence of the hetman of the Kuban Cossacks. Pop. (1897) 65,697.

Yekaterino-Nibolsk, a settlement of the Amur Cossacks, Amur prov., Siberia, on l. bk. of Amur, 100 m. W. of the mouth of the Sungari.

Yelatma, tn., gov. Tambov, Central Russia, on l. bk. of Oka, 83 m. E.N.E. of Ryazan; has manufactures of agricultural implements. Pop. (1897) 8,617.

Yelisavetgrad. See ELIZAVETGRAD.

Yelisavetpol, or ELIZABETPOL. (1.) Government, Russia, in Transcaucasia, extends from the main range of the Caucasus across the Kura steppe to the river Aras. The southern part is chiefly occupied by mountain ranges and tablelands, and agriculture is confined to the valleys, where mulberry trees are grown to feed silkworms, and some wine is produced. Copper, magnetic iron, and cobalt are obtained. Armenians and Tartars are the predominating elements

of the population. There are also Dukhobors and Molokani (Russian dissenting sects), and German colonies. Area, 16,721 sq. m. Pop. (1897) 871,557. (2.) Town, cap. of above gov., 106 m. S.E. of Tifis; was known as Ganzha until 1804. It has a citadel and a mosque, built about 1620 by Shah Abbas of Persia, and was the birthplace of the 12th-century Persian poet Nizam-ed-Din. Yelisavetpol is noted for its grapes, and other fruits are grown. Pop. (1897) 33,090.

Yell, second largest isl. of the Shetland group, Scotland, lying N. of Mainland, and separated from it by Yell Sound. It is 17 m. from N. to S., and covers an area of 81 sq. m. Fishing is the chief industry. Pop. (1901) 2,483.

Yellow Bird, a name given in America to the goldfinch and to the warbler.

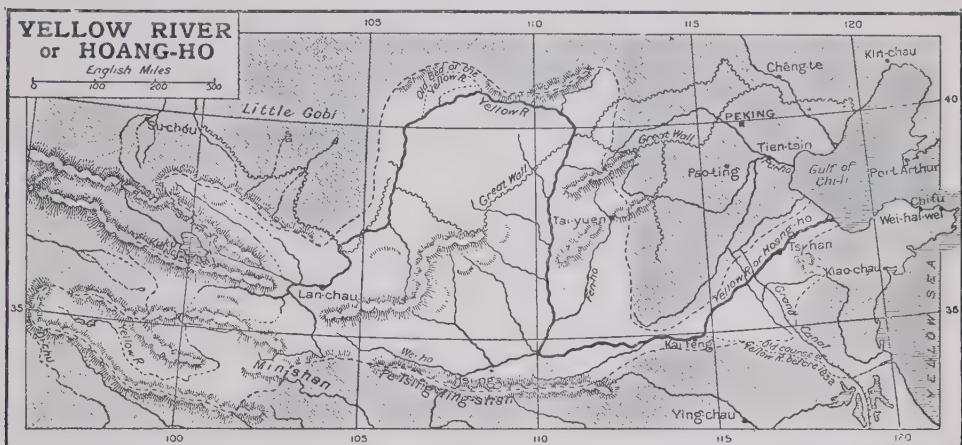
perature. The initial fever is followed by a remission marked by fall of temperature and abatement of the symptoms. Convalescence may then follow; but in the majority of cases a third stage or febrile reaction ensues, in which the temperature again rises, with great aggravation of the symptoms, rapid development of jaundice, and increase of the vomiting. In a considerable number of cases black vomit points to gastric hæmorrhage, and frequently the stools also are hæmorrhagic. Bleeding may likewise occur from the kidneys, the gums, and the skin, and albuminuria is common. In its graver forms yellow fever is one of the most fatal of epidemic diseases, and even in its milder forms relapses are common; but one attack usually confers immunity for the rest of the patient's life. In

Yellow-hammer, or **YELLOW-BUNTING** (*Emberiza citrinella*), a species of bunting, common throughout Britain and northern Europe generally, and extending into Siberia. It is resident throughout the year in the Brit-



Yellow-hammer.

ish area, and is very abundant in many localities. The length is about six and a half inches, and the general colouring mottled brown above and yellow below, the head being yellow, streaked with brown, and the rump and tail coverts chestnut. The male is



Yellow Chill. See **BLACK-WATER FEVER**.

Yellow Fever, a febrile disease endemic in the tropical and sub-tropical regions of Central and S. America, in the W. Indies, and in tropical W. Africa. It has also appeared in epidemic form in the southern parts of the United States. Negroes are much less susceptible to infection than are whites, and temporary visitors are more liable to the disease than are residents. Yellow fever is characterized by jaundice and by hæmorrhages, and is due to the action of a specific virus in the blood. The germ has not yet been identified, but a mosquito, the *Stegomyia fasciata*, is responsible for its conveyance from one victim to another. The incubation period is usually three or four days, but it may be only twenty-four hours. The onset is associated with headache, rigor, vomiting, and rapid rise of tem-

perature. The treatment of yellow fever the patient's strength should be maintained at the highest possible level, and heart tonics and stimulants are often of service. Drugs given by the mouth are seldom efficacious, but the sickness may be checked by sucking small quantities of ice, and by hypodermic injections of morphine. Nutritive enemata are valuable while the vomiting continues. An energetic campaign against mosquitoes has resulted in the suppression of the disease wherever the campaign has been carried out efficiently. The means employed are similar to those for the extermination of the malaria-carrying mosquito. As the insect breeds in stagnant water, all puddles, cesspools, drains, and similar breeding places are treated with petroleum, and all receptacles for containing water must be rendered mosquito proof.

more brightly coloured than his mate, and has a somewhat monotonous song. The food is chiefly insects in spring and summer; fruit, especially blackberries, in autumn; and grain and seeds in winter. The nest is placed usually upon the ground, and contains from four to five eggs.

Yellow Pigments. See **PIGMENTS**.

Yellow Remittent Fever. See **BLACKWATER FEVER**.

Yellow River, **HWANG-HO**, or **HOANG-HO**, riv. of China, drains a basin of over 600,000 sq. m., and is estimated at nearly 2,500 m. long. It rises to the S. of the Shuga range, between Tsaidam and the Tang-la range in Tibet, near the sources of the Yang-tse-kiang, and soon after passes through Jaring-nor and Oring-nor. In deep ravines, it sweeps round the S.E. end of the Amnemachin Mts., cuts through the Burkhan-Buddha range, and

striking E. enters the province of Kan-su. From Lan-chou in that province it turns sharply N.N.E. to lat. 41° , rounds the Ordos desert, where its course has varied considerably at different times, and on passing long. 111° plunges S. through a gorge which separates the province of Shen-si from the province of Shan-si, until in about lat. 34° it meets the Wei and turns at right angles (E.). For 120 m. farther high banks confine its course, but below Meng-chin it expands and shallows, and from Su-shui onwards embankments impose but a temporary check on its ravages. At Lung-mên-kou, E. of Kai-feng, the river turns N.E. in a bed adopted in 1852,

Yellow Sea, or HWANG-HAI, division of the Pacific Ocean, between Korea and China, divides into the Gulf of Korea, the Gulf of Pechili, and its N. branch the Gulf of Liao-tung. It is shallow, and nowhere more than 300 ft. deep. It is generally supposed to receive its name from the Hwang-ho or Yellow R., which carries down much yellow mud from the interior.

Yellowstone, riv. of the western United States, a right-hand branch of the Missouri, rises in N.W. Wyoming, flows N. across Yellowstone National Park into Montana, where it turns to the E. and then to the N.E., joining the Missouri on the w. boundary of N. Dakota. In the Yellow-

government. The park is nearly rectangular in form, being 54 m. E. and W. by 62 m. N. and S. Its surface consists largely of a rolling plateau of nearly 8,000 ft. elevation, from which arise several groups and short ranges of mountains (10,000 to 12,000 ft.), while along the E. border lies the rugged Absaroka range. It is drained N. by the Yellowstone and Madison Rs., and S. by the Snake. Its surface is dotted with lakes, the largest being Yellowstone Lake. Its streams contain numerous falls and rapids, the most notable of which is the Lower Yellowstone, 325 ft. in height. Its streams, particularly the Yellowstone, flow in deep cañons. The Grand Cañon of the Yellowstone is celebrated not so much for its depth and magnitude as for the bright colouring of the rocks in which it is cut. Hot springs are found in almost all parts of the region, while the geysers are confined to a few localities. Near the N. boundary are the Mammoth Hot Springs. Upon Madison R. in the W. part of the park are several groups of geysers—the Norris Geyser basin, and the Upper and Lower Geyser basins. Of these, the most notable is the last, which contains many geysers throwing water to heights of from 100 to 200 ft., and in such volume that the waters of the Madison R., here called the 'Fire Hole,' are warm even in winter. A group of geysers and hot springs is found on the shore of Shoshone Lake, at the head of Snake R., and upon the shores of Heart Lake. On the Yellowstone R., a short distance below Yellowstone Lake, is a geyser throwing thick mud instead of water. The park is traversed by coaches, running along excellent wagon roads, with hotels at several points.

Yellow Wood (*Cladrastis tinctoria*), an American tree belonging to the order Leguminosae. It is a tall-growing tree, with a smooth bark and yellow wood. In summer it bears loose, drooping panicles of long, fragrant, white flowers. The whole tree is of a graceful habit. From its wood a dye is prepared.

Yemen. See ARABIA.

Yen-bai, tn., cap. of a circle in Tong-king, French Indo-China, 78 m. N.W. of Hanoi, the head of navigation on the Red R.

Yenikale. See KERCH.

Yenisei, riv. of Siberia, flowing into the Arctic Ocean. Its sources lie S. of the Sayanski Mts., and after breaking through these it flows generally N., picks up from the right the Upper Tunguska or Angara, and after receiving, also on its right bank, the Stony Tunguska and the



Yellowstone National Park.

and continues its course through low-lying land to the sea—i.e. the Gulf of Pechili. The Tao-ho (r. bk.) and Ta-tung (l. bk.) in Kan-su, the Fên (l. bk.) in Shan-si, the Lo (r. bk.) and Chin-shin (l. bk.) in Ho-nan, are its only large tributaries. From Lan-chou rafts descend to Pao-tou and Ho-kou, and occasionally even to Tung-kuan. East of that place boats venture on the river, and near Kai-feng there is some boat traffic; but large boats only come as far up the river as Tsi-ho (port of Tsi-nan-fu), and sea-going junks to Tieh-mên-kuan. Since 602 A.D. the river has shifted its mouth ten times between lat. 34° and 39° N., the last change occurring in 1889.

stone Park it flows through Yellowstone Lake and over the upper and lower falls (90 and 325 ft. in height respectively), and through the Yellowstone cañon. It is navigable for small steamers from the mouth to Livingston in Montana. Its length from its mouth to Yellowstone Lake is 569 m., and its drainage area is 69,683 sq. m. The mean discharge at Livingston is 4,400 cub. ft. per second. It is navigable to Livingston.

Yellowstone National Park, a tract of land comprising 3,348 sq. m., lying mainly in N.W. Wyoming, and extending slightly over into Idaho and Montana. It has been reserved from settlement by the United States



Views in Yellowstone National Park.

1. Cañon of the Yellowstone River. 2. Main Hot Springs, edges of formation. 3. Rapids of the Yellowstone River. 4. Mammoth paint pots, Fire Hole Geyser Basin. 5. Pulpit Terraces. 6. 'The Giantess' Geyser in eruption. 7. Lower Yellowstone Fall. 8. Grotto Geyser, Fire Hole Valley.

Lower Tunguska, and spreading out to a great width, enters the Yenisei Gulf by a mouth 13 m. wide. The drainage area is 1,000,000 sq. m., and the length of the river 3,000 m. But if the Selenga be taken as its upper course, its length is fully 500 m. greater. The Selenga, formed by streams flowing from the Kosso-gol and the Khangai Mts., and joined by the Orkhon from the edge of the Gobi, enters Lake Baikal. Steamers ply about 170 m. up. Along the Angara steamers ply regularly between Listvenichnoye, on Lake Baikal, and Konovalovo, below Balagansk. Below Bratski Ostrog a series of rapids blocks this river, but the bed is being cleared. On the main Yenisei steamers ply from Yeniseisk to Minusinsk, about 450 m. Boats only are used below Yeniseisk. Like the Obi, the Yenisei has been several times reached by sea, Captain Wiggins having first entered the mouth in 1874. There are altogether 12,240 m. of navigable waterways in Lake Baikal and the Yenisei basin, of which 3,710 are utilized by steamers.

Yeniseisk. (1.) Government of E. Siberia, extending from the Sayan Mts. on the Chinese frontier N. to the Arctic Ocean, and from the Anabara R. on the E. to the watershed between the Yenisei and Ob Rs. on the W. In the S. are the wooded slopes of the Sayan Mts. and of the Kuznetski Ala-tau, with their mines; N. of these the agricultural regions of Minusinsk, Achinsk, and Kansk; then a broad belt of forest reaches up into the Arctic circle and along the rivers up to 70°. Beyond the mouth of the Podkamennaya (Stony) Tunguska the country to the E. of the Yenisei contains numerous ranges, the chief of which is the Siverma. There are mines on the Pit, Lower Tunguska, and other right-hand affluents of the Yenisei. Coal and iron are mined on the Abakan R. Rich deposits of graphite, in the valleys of the Lower Tunguska and Bakhta, have been worked since 1891. The native inhabitants live by grazing, reindeer-hunting, and fishing. They belong to the Samoyede, Yakut, Ostiak, and Tungus families. In the S. are the Buriat Mongols. Area, 981,607 sq. m. Pop. (1897) 572,847. (2.) Chief town of above government, Siberia, on l. bk. of Yenisei, 170 m. N.N.W. of Krasnoyarsk. It was founded in 1618. Pop. (1897) 11,539.

Yeola, tn., Nasik dist., Bombay Presidency, India, 58 m. N.W. of Aurangabad. It is noted for its gold-twist and cotton and silk goods. The silk trade employs about 7,000 persons.

Yeoman, a term used in the 15th and 16th centuries to describe a small freeholder. It was also given later to the 'forty shillings freeholder' by Parliament, and has been understood to signify the class which lies between the substantial farmer and the labourer.

Yeomanry, an irregular cavalry force provided in Great Britain, raised among men willing to provide their own horses, and officered chiefly by country gentlemen. They are armed by the state, which also makes a small allowance towards the provision of clothing, etc. The regiments meet yearly for six days' drill, besides which each yeoman has to attend five squadron drills and six squad drills every year. The yeomanry is not liable to service abroad, but is subject to the Army Act when training, when attached to regular troops, when on actual military service, or when called out or assembled voluntarily in aid of the civil power. There have hitherto been thirty-eight regiments, with an average establishment of 300 men. The demand for the services of mounted riflemen in S. Africa led to the formation of the Imperial Yeomanry, and the nucleus of that body was furnished by volunteers from the permanent yeomanry, while some squadrons were raised in Ireland. This led, in 1900, to a scheme for the complete reorganization of the yeomanry in the United Kingdom. The main features of this scheme are as follows:—(1.) The establishment of the permanent yeomanry to be raised from about 12,000 men to about 27,500 or more. (2.) The 56 regiments to have an establishment of about 450 men, and each to contain a special service squadron of about 100 men, willing to serve abroad in time of war, if required. (3.) A considerable increase in the pay and allowances, and a special allowance of £5 a year to men providing their own horses. (4.) The training to be increased to twenty-one continuous days yearly, and to be carried on in camp. (5.) The officers to be compulsorily attached for instruction to the regular forces for certain periods.

Yeomen of the Guard, an ancient bodyguard of the sovereign, first organized in 1485 by Henry VII. It is recruited from deserving old soldiers of distinguished service. Exclusive of officers, the corps numbers 100. The officers are chosen from among retired officers of the army of distinguished service and good family. They consist of a captain, usually a peer, a lieutenant, an ensign, a clerk of the cheque (who keeps and

calls the cheque or roll), and four exons (a term formerly equivalent to corporal). The yeomen of the guard wear a scarlet uniform of quaint Tudor pattern, highly decorated with royal emblems; that of the officers is of a more modern type. The men are armed with partisans and short swords. The bodyguard is on duty at the King's levees and drawing-rooms, and at almost all court ceremonies. The warders of the Tower wear the same uniform, and are honorary members of the corps; but they have distinct duties connected with the Tower of London, and are not part of the bodyguard, nor under its officers. The term 'beefeater' (*buffetier*, or 'sideboard man') is commonly applied to both yeomen and warders. See Sir R. Hennell's *History of the Yeomen of the Guard* (1904).

Yeovil, munic. bor., Somersetshire, England, on the Ye, 22 m. S. of Wells. St. John's, a handsome 14th-century church, is called 'the Lantern of the West'—crypt 13th century. The town is noted for the manufacture of gloves. Pop. (1901) 9,861.

Yerkes, CHARLES TYSON (1837-1905), American financier, was born at Philadelphia. In 1860 he secured a controlling interest in a Philadelphia street railway. He thereafter acquired large interests in continental, New York, and Chicago lines. The problem of London traffic and the projected Central London Railway attracted him, and he became a large shareholder in the London underground line, and a strong advocate for their electrification. The Underground Electric Railway Company, Limited, with a capital of £5,000,000, and Mr. Yerkes as chairman, was founded with the object of converting the metropolitan district lines from steam to electric traction, and to construct or complete and equip the Charing Cross, Hampstead, Baker Street, Waterloo, Great Northern, Edgware, and Watford lines. Mr. Yerkes founded the Yerkes Observatory at Lake Geneva, Wisconsin, and did much for the amelioration of the conditions of the poorer classes in Chicago and the other great cities with which he was connected.

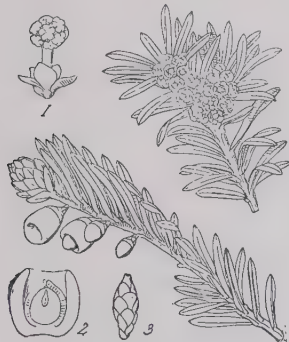
Yermak. See ICE-BREAKER.
Yermak, TIMOFEEV (d. c. 1584), a Cossack who subdued a large part of Siberia in 1580. He was drowned whilst attempting to cross the Irtysh.

Yessentuki, health resort in Northern Caucasus, Russia, with alkaline springs, between Pyatigorsk and Kislovodsk, 10 m. from the former.

Yesso, YEZO, or EZO, the most northerly of the main islands of

Japan, and officially known as Hokkaido, is separated from Honshiu by Tsugaru Strait, and from Sakhalin by La Pérouse Strait. It covers an area of 36,289 sq. m., and is traversed from N. to S. by a central mountain chain, with some peaks approaching 7,000 ft. The Ishikari-gawa (400 m.) is the longest river in Japan. Fishing is the chief industry. Coal and sulphur are exported from Kushiro. Other places of importance are Hakodate (the cap.), Sapporo, and Otaru. Pop. (1903) 843,717.

Yetholm, par., Roxburghshire, Scotland, and double village—Kirk-Yetholm and Town-Yetholm— $\frac{1}{2}$ m. apart, on the Bowmont, $7\frac{1}{2}$ m. S.E. of Kelso and $1\frac{1}{2}$ m. from the English border. It is the headquarters of the Scottish gypsies. Pop. (1901) 802. See Brockie's *Yetholm Gipsies* (1884) and Lucas's *Yetholm History of the Gipsies* (1882).



Common Yew.

1, Male flower; 2, fruit (section); 3, female flower.

Yew. The common yew (*Taxus baccata*) is a British evergreen tree of geological antiquity. It bears long, linear, coriaceous leaves, in colour dark above and pale beneath. Its fruit is borne with a red mucilaginous cup. The trunk has the curious appearance of being composed of a number of branches welded together. Usually at a few feet above the ground the trunk sends out leafy horizontal branches, which spread like great arms over a considerable area. Yew trees were very commonly planted in churchyards in Britain, probably for the reason alleged by Martyn—that it was an evergreen tree, and therefore a symbol of immortality. The ancient Britons, before the introduction of Christianity, planted yew trees near their temples.

Yezd, or YAZD, tn., Central Persia, cap. of prov. of same name, 180 m. E.S.E. of Ispahan; has manufactures of silk, cotton,

pottery, and felt. It is almost the only seat in Persia of the Gebrs, or Parsis, followers of Zoroaster. Pop. 45,000.

Yezidis, or YEZDIS, a religious sect dispersed in small groups over Asia Minor, Armenia, Kurdistan, Mesopotamia, Persia, Arabia, and even as far east as China, numbering collectively about 50,000. They recognize as their supreme head the sheik-khán, resident at Baadli, 27 m. N.E. of Mosul. To their neighbours they are commonly known as Shaíttáni ('devil-worshippers'), or Shem-sieh ('star-worshippers'); but they call themselves Davasem, a term, like Yezid, of unknown origin and meaning. Simbath, their reputed 'apostle,' is supposed to have been a Christian Nestorian (or perhaps Gnostic), who flourished in the 9th century in the district of Van, Kurdistan; and Kurdish is still the current speech of most of their communities. But according to another theory their real founder was Sheikh Adi, who lived in the 14th century, and to whom is attributed the *Furkal*, or *Aswad*, a sacred book which contains their laws and liturgy, but has never been seen by any one. Their religious tenets betray Jewish, Moslem, Mazdean, and especially early Christian (Nestorian) influences. Although hated and slandered by all other sectaries, and often oppressed by the Turkish pashas, the Yezidis are a peaceful, industrious people, noted for their cleanly habits, and better conducted than most of their neighbours, but absolutely unlettered, so that all their laws, precepts, national legends, songs, and traditions have been handed on orally from the remote past. See W. G. Palgrave's *Official Report* (1868), and C. M. MacGregor's *Turkey in Asia* (1877).

Yezo, or Ezo. See YESSO.

Yggdrasil, in Norse mythology, the mystical ash tree, which typifies existence. Its three roots stretch respectively into the realms of the gods, the giants, and of death; its stem supports the earth; its boughs overspread the whole world and reach beyond the heavens. Yggdrasil will survive the 'twilight of the gods' (Ragnarök).

Yiddish, a dialect spoken by the Jews of Central Europe, introduced by immigrants, and consisting of corrupted Hebrew, with a large admixture of German. In the east end of London, where Yiddish prevails, a Jew is called—in slang—a Yid, Yiddisher, Yeddán, or Jeddican. There is a considerable literature written in this jargon, mostly of a religious character, from the 16th to the 19th century, but since the beginning of the Zionist move-

ment and the persecutions in Russia (1880) it has taken a wider range. Yiddish boasts one poet of considerable power in Rosenfeld—e.g. his *Songs from the Ghetto* (1898). See Grünbaum's *Jüdisch-deutsche Chrestomathie* (1882), and Wiener's *The History of Yiddish Literature in the Nineteenth Century* (1899).

Y.M.C.A., Young Men's Christian Association.

Ymir. See MYTHOLOGY, NORTHERN.

Yo-chou, city, prov. Hu-nan, China, at outlet of Tung-ting Lake into the Yang-tse-kiang, opened to foreign trade in 1900. As the gate to Hu-nan it is important, but foreign trade is only slowly developing.

Yoga, in Hindu philosophy, one of the six Darsanas, or schools of Brahmanical philosophy, that of Patanjali, the essence of which is meditation on the Supreme Spirit and mortification of the body. Its disciples, Yogis, traverse India as fortune-tellers and conjurers.

Yokohama, chief seaport of Japan, on E. coast of Honshiu, and on Tokyo Bay, 16 m. S.S.W. of Tokyo and opposite Kanagawa, which it superseded as a treaty port in 1858. The harbour is protected by breakwaters, and there are four government dry docks. Silk, tea, cotton, flax, tobacco, copper, and coal are traded in. The well-to-do residents have their residences on 'The Bluff.' Imports (1904), £13,886,063; exports, £17,355,829. Pop. (1903) 326,035.

Yöng-am-po, seapt., at the mouth of the Yalu, N.W. Korea.

Yonge, CHARLES DUKE (1812-91), English historian, was born at Eton, and engaged in tutorial and literary work in London. In 1866 he was appointed regius professor of modern history and English literature at Queen's College, Belfast, an appointment which he held till his death. He was the author of numerous text-books on Greek and Latin composition and grammar, compiled various classical and other dictionaries, and wrote *A History of the British Navy* (1863), *History of the English Revolution* (1874), and *Constitutional History of England* (1881).

Yonge, CHARLOTTE MARY (1823-1901), English novelist, spent her life chiefly at Otterbourne, Hampshire, her native place. Among her most popular novels are the *Heir of Redclyffe* (1853), *The Daisy Chain* (1883), *Modern Broods*, her last novel, appeared in 1900. Several books on historical subjects, on mission work, and on natural history testify to the versatility of her talent. See *Life and Letters* (ed. C. Coleridge, 1903).

Yonkers, city, Westchester co., New York, U.S.A., on the Hudson, 17 m. above New York, of which it is a residential suburb. It manufactures carpets, rugs, and hats. Pop. (1900) 47,931.

Yonne, dep. of N.E. France, traversed by the Yonne; covers an area of 2,892 sq. m. It is undulating. Agriculture, forestry, mining, quarrying of building-stone, vine-growing, sugar-refining, and glass-making are carried on. Chief town, Auxerre. Pop. (1901) 321,062.

York, munic. parl. and co. bor., city and head of the northern archbishopric, England, on the Ouse 191 m. N. by W. of Lon-

don, is principally 17th and 18th century, with some vestiges of the earlier building. The castle at York was founded by William the Conqueror, but the present buildings are of various later dates. It is now used as a military prison and for the county assize court. The city is the headquarters of the N.E. military district, and there are large barracks near Fulford. Manufactures include glass, confectionery, leather, artificial manure, railway carriages, iron-founding, etc. *Coer Efrog* (as then named) was capital of the Brigantes. By the Romans it was called *Eboracum*, and became their military head-

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York Minster.

[Photo by Frith.

don. The city was formerly surrounded by walls, the larger portion of which, with four ancient gateways or 'bars,' still remains. The cathedral church of St. Peter was founded in the 7th century. The present building, a magnificent cruciform structure, exhibits various styles of architecture, having been begun by Archbishop Roger (1171), and continued by his successors till 1472. It retains a Norman crypt, and possibly some fragments of Saxon work; and amongst several tombs of the archbishops is one of Walter de Grey (13th century). There are several other ancient churches. The archiepiscopal palace at Bishopthorpe, 3 m.

quarters, and the usual residence of the emperors when they visited Britain. Septimius Severus and Constantine Chlorus died there. In early times it was a centre of Christianity. Saxon paganism subsequently obscured Christianity; but in 627 Edwin of Northumbria was baptized at York by Paulinus, who soon after became archbishop. In 1405 Archbishop Scrope was executed here, and in 1557 Aske, leader of the 'Pilgrimage of Grace.' In 1644 it was besieged and taken by the parliamentary forces. Pop. (1901), munic. bor., 77,914.

York. (1.) City, Nebraska, U.S.A., co. seat of York co., 50 m. W. of Lincoln. Pop. (1900)

of the opposition to Queen Margaret, wife of Henry VI., until he fell at the battle of Wakefield (1460). His eldest son was Edward IV., and his second son, Richard III. By marrying Elizabeth, daughter of Edward IV., Henry VII. united the families of Lancaster and York, and strengthened his own position. For some years, however, the descendants of Elizabeth and George, Duke of Clarence, the younger children of Richard, Duke of York, continued to be a source of alarm to the Tudor sovereigns. The dukedom of York is generally conferred on his second son by the king of England. Among others who

have borne the title are Henry VIII., Charles I., James II., Cardinal York (son of the Old Pretender), and the present Prince of Wales, who was created Duke of York in 1892. See Ramsay's *Lancaster and York* (1895).

Yorke, Philip, FIRST EARL OF HARDWICKE (1690-1764), lord chancellor of England, was born at Dover, and called to the bar in 1715. He attached himself to the Pelham interest, by whose influence he was returned to Parliament (1719), and became solicitor-general, and was knighted (1720). He gave a loyal support to Walpole, defending him against the attacks of Carteret

Robin Hood Bays. The surface is varied, mountainous, and moorland in N.W. and N.E. On N.W. border is the Pennine Range (Whenside, 2,414 ft.; Ingleborough, 2,372 ft.), in N.E. are the Cleveland and Hambleton Hills, and in the E. the Wolds. The county is drained chiefly to the Humber by the Ouse and its tributaries Swale, Ure, Wharfe, and Don; on the N. border is the Tees; Esk, Derwent, and other streams flow direct to the North Sea, and the Hull enters the Humber. In the W. is the upper valley of the Ribble. The scenery in several of the river dales is beautiful. Yorkshire is divided

seventy-five in N. Riding and twenty-two in W. Riding, and the total output of pig iron was 2,378,796 tons. The county returns twenty-six members to Parliament. Antiquities include ancient encampments, earthworks, monastic establishments (Rievaulx, Jervaulx, Whitby), and castles. E. Riding—area, 749,513 ac.; pop. (1901) 384,997. N. Riding—area, 1,362,560 ac.; pop. 379,396. W. Riding—area, 1,766,664 ac.; pop. 2,744,848.

Yorkshire College. See LEEDS.

Yorkshire Terrier, one of the most exquisite little dogs in existence; but its coat, trailing on



in 1742. In 1733 he became chief justice, and in 1737 lord chancellor. He supported the Spanish war as inevitable, and directed the course of the administration during the rebellion in 1745. He was created Earl of Hardwicke and Viscount Royston (1754). As a lawyer he made equity a scientific system, instead of a mere chaos of precedents.

York Plays. See MIRACLE PLAY.

Yorkshire, north-east maritime co., the largest in England. The coasts are generally regular, bordered by cliffs of moderate height. The principal indentations are Bridlington, Filey, and

for administrative purposes into Ridings—North, East, and West—each constituting a separate administrative county. It is an agricultural and grazing county. Coal, especially in the W. Riding, iron ore (Cleveland district), clay, limestone, and sandstone are extensively worked. There are mineral springs at Harrogate, Knaresborough, and Ilkley. The manufacturing centres are chiefly in connection with the coal-field of the W. Riding; woollens (Leeds, Bradford, Halifax, etc.); cotton and worsted goods, carpets, silk; cutlery, armour plate, and other heavy iron goods (Sheffield, etc.); leather (Leeds). The blast-furnaces in 1904 numbered

the ground, silken and flossy, requires the utmost 'grooming' and attention. It was formerly known as the Scottish broken-haired terrier. It varies in weight from 3 to 13 lbs.; but there is very little chance for any animal scaling over 8 lbs. winning in the ring. Points:—Head moderately long and wedge-shaped; eyes of medium size, very keen and intelligent; ears (since cropping was abolished) carried semi-erect and V-shaped; body short and compact, covered with an abundance of long, straight hair, as fine and glossy as silk—that on body should be steel blue, free from black or tan hairs; the tail, which is usually

docked, should be feathered with dark-blue hair; face should have a long moustache of rich tan; the hair on the forehead should be of a light golden shade, while on the neck there should be a streak of rich, bright tan; legs straight, sound, and well tanned.

Yorktown, cap. of York co., Virginia, U.S.A., on York R., 35 m. E.S.E. of Richmond; was the scene of the surrender of Lord Cornwallis to Washington on Oct. 19, 1781. Pop. (1900) 151.

York von Wartenburg, HANS DAVID LUDWIG, COUNT (1759-1830), Prussian field-marshal, born at Potsdam. After service with the Dutch in the E. Indies, he entered, or rather re-entered (1787), the Prussian army. After a distinguished career in the Napoleonic wars (1794-1814), especially in the

cities, of which the most famous is Abeokuta, the capital of the Egbas. Yoruba is now included in the British colony of Southern Nigeria.

Yosemite Park, a tract of land in the Sierra Nevada of California, U.S.A., which has been reserved from settlement as a national park. There are, in fact, two parks. The Yosemite Valley State Park comprises 36,000 ac., which includes the Yosemite valley. This park belongs to the state of California, and is under its jurisdiction. Surrounding this is a much larger park, the Yosemite National Park, comprising 1,512 sq. m., which has been reserved by, and is under the control of, the United States government. The Yosemite valley is a gorge cut by glacial action. It is not more

floor of the valley being about 4000 ft. above sea-level. The country surrounding the valley and constituting the National Park forms a portion of the western slope of the Sierra Nevada. It presents in the main the aspect of a rolling and hilly region, at an elevation of from 8,000 to 10,000 ft. above sea-level, with little soil or vegetation except a scattered forest growth. Fragments of glaciers still remain near the summits of the mountains. From this surface rise irregular domes and pinnacles of shattered granite, while the valleys in which soil has accumulated are well watered and covered with vegetation.

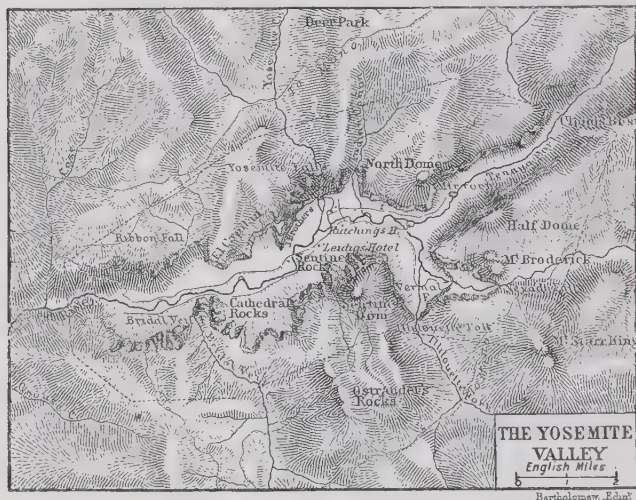
Youatt, WILLIAM (1776-1847), English veterinary surgeon, was born at Exeter. He began in 1823 a series of extra-mural lectures, which from 1830 to 1835 were delivered at London University—i.e. University College; and when the course was dropped he published them in the *Veterinarian*, a paper he had established. He wrote *Canine Madness* (1830); *The Horse* (1831); *Cattle—their Breeds and Diseases* (1834); *The Dog* (1845); *The Pig* (1847); and other works for the Library of Useful Knowledge.

Youghal, mkt. tn., seapt., and summer resort, co. Cork, Ireland, on Blackwater estuary. Portions of the old town walls and Sir Walter Raleigh's house still remain. Earthenware and bricks are manufactured. There is also an important salmon fishery. Pop. (1901) 5,393.

Youmans, EDWARD LIVINGSTONE (1821-87), American scientist, born at Colman, New York, was blind for several years as a boy. After taking his M.D. at Vermont, he became professor of chemistry at Antioch College (1866). Among his works are *Alcohol and the Constitution of Man* (1855); *Handbook of Household Science* (1857); *The Correlation and Conservation of Forces* (1864); and *The Culture demanded by Modern Life* (1867). Till his death he was editor of the *Popular Science Monthly*, founded in 1872; and in 1871 planned the International Scientific Series. He was a popular lecturer in America, his principal subjects being 'The Chemistry of the Sunbeam' and 'The Dynamics of Life.' See *Life and Letters of Edward Livingstone Youmans*, by Fiske (1894).

Young, tnsph., New South Wales, Australia, on N. side Burragong Creek, 70 m. W.N.W. of Goulburn; with gold mines. Pop. (1901) 2,755.

Young, SIR ALLEN WILLIAM (1830), English Arctic explorer, was born at Twickenham. As a naval officer he fought in the



years 1813-14, he was created count (1814) and field-marshal (1821). See *Life*, in German, by Droysen (10th ed. 1889).

Yorubas, a people occupying the country between Dahomey and the Niger, and parts of the lower Niger and Niger delta. They are negroes, but do not exhibit the physical characteristics of the race to so marked a degree as their neighbours on the west, and are superior in culture. The old Yoruba kingdom was broken up in 1820 by an invasion of the Mohammedan Fulahs, who captured the city of Ilorin. Under the influence of Mohammedan institutions, and in the south of Christian missionaries, the Yorubas have made great progress in the arts of civilization. They are still divided into a number of tribes, each under its own chief, and are collected in populous

than seven miles in length, with an average breadth at bottom of half a mile, and from cliff to cliff of a mile and a half. Its depth ranges from 4,000 to 5,000 ft.; its walls are everywhere precipitous, and in many places vertical. The cliffs, domes, etc., along its walls form some of the finest scenery in the country. The valley is drained by the Merced, which with its affluents forms cascades of great height—e.g. Nevada Fall, 600 ft.; Vernal Fall, 400 ft.; Illilouette Fall, 600 ft.; Yosemite Falls (three in succession), 2,600 ft.; and Bridal Veil Fall, 900 ft. Well-known summits surrounding the valley are El Capitan, a sheer cliff rising from the valley to an elevation of 7,630 ft. above the sea; Sentinel Dome, 8,205 ft.; Glacier Point, 7,297 ft.; and Half Dome, 6,927 ft.; the elevation of the



Scenes in the Yosemite Valley.

1. Bridal Veil Fall (900 ft.). 2. El Capitan in clouds. 3. The Sentinel (3,065 ft. above the valley). 4. Mirror Lake, Yosemite Park. 5. Glacier Point (3,211 ft.). 6. Merced River from Pohono Bridge. 7. North Dome (3,633 ft.), Royal Arches, and Washington Column (2,200 ft.). (Photos, except No. 4, by Taber, San Francisco.)

Crimea, was engaged in the search for Sir John Franklin, took an active part in the quelling of the Taeping rebellion in China under General Gordon, and was in command of the *Pandora* in the Arctic expedition of 1875-6. He was knighted in 1877. He published *Two Voyages of the Pandora in 1875 and 1876* (1879).

Young, ANDREW (1807-89), Scottish hymn-writer, was born in Edinburgh, and became a schoolmaster at Niddrie (1830) and then at St. Andrews (1840-53). He published *The Scottish Highlands, and other Poems in 1876*; but he is best known as the author of *There is a Happy Land*, which he wrote in 1838.

Young, ARTHUR (1741-1820), English agricultural author, lived chiefly at Bradfield Hall in Suffolk. The result of tours, undertaken with a view to studying agricultural methods, appeared in *A Six Weeks' Tour through the Southern Counties* (1768), *A Six Months' Tour through the North of England* (4 vols. 1771), and *A Tour in Ireland* (1780). He claimed that the distress in Ireland resulted, not from ill-treatment by England, but from the penal laws against Roman Catholics, and the carelessness of absentee landlords. In 1792-4 appeared Young's *Travels in France* (2 vols.), the record of journeys undertaken from 1787 to 1790, in which he added acute observation of political and social conditions to his investigation of the state of agriculture. Young was also editor of, and a frequent contributor to, a monthly periodical, *Annals of Agriculture*. His publications gave a decided impulse to the scientific study of agriculture, previously almost unknown in England. See *Autobiography*, ed. by Miss Betham-Edwards (1898).

Young, BRIGHAM (1801-77), leader of the Mormons, born at Whitingham, Vermont; became a Mormon convert in 1832. In 1844 he was elected president of the Mormon Church. He founded (1848) Salt Lake City in Utah. He was appointed governor (1851), but had to resign much of his power when the States, in 1869, abolished polygamy. See *MORMONS and UTAH*.

Young, CHARLES MAYNE (1777-1856), English actor, was born in London. At Edinburgh, in 1802, he played Doricourt in the *Belle's Stratagem*, and won the friendship of Scott. In 1807 he made his first appearance in London as Hamlet. In the interregnum between Kemble and Kean and Macready, Young held the first place as a Shakespearean actor. His best parts are said to have been Hamlet, Octavian, Macbeth,

Prospero, and Cassius, with Sir Pertinax Macsycophant and Megrim (in *Blue Devils*) as his comic characters.

Young, EDWARD (1683-1765), English poet, was born at Upham, near Winchester. In 1708 he was appointed to a law fellowship at All Souls, Oxford. He was befriended by the Duke of Wharton. In 1719 his tragedy *Busiris* was produced at Drury Lane; and in 1721 another tragedy, *The Revenge*. He published his satires, entitled *Love of Fame, the Universal Passion*, separately from 1725, and collectively in 1728. They anticipate Pope, but lack his fire and his asperity. On the accession of George II. he wrote *Ocean: An Ode*; but Young as a lyric poet is extraordinarily feeble. In 1728 he became a clergyman, and was appointed chaplain to George II. He held the living of Welwyn (Herts) till his death. In 1730 he published his *Imperium Pelagi*, another lyric. *The Complaint, or Night Thoughts on Life, Death, and Immortality* (1742), Young's greatest poem, was begun in 1741. A certain 'staginess' blemishes his otherwise beautiful poem. There are nine 'Nights' in blank verse, and Johnson, the declared enemy of that form, admits that in no other could the work have been so effectively written. It was completed in 1744, and with the almost contemporary *Grave of Blair* (1743), Hervey's (prose) *Meditations among the Tombs* (1746), and Gray's *Elegy* (1750), diffused over English literature an atmosphere of 'churchyard' melancholy. *The Night Thoughts* have supplied us with many quotations; the diction is often sublime, but sometimes exaggerated; often pointed, but sometimes marred by false antithesis. See Herbert Croft's account of him in Johnson's *Lives of the Poets*, and Boswell's *Life of Johnson*.

Young, SIR FREDERICK (1817), English traveller, born at Limehouse, London; became a merchant, and travelled in Greece, Turkey, and Canada. He has written *Long Ago and Now* (1863), *Imperial Federation* (1876), *A Winter Tour in South Africa* (1890), *Exit Party* (1900), and *A Pioneer of Imperial Federation in Canada* (1902).

Young, JAMES (1811-83), Scottish chemist, and inventor of a successful method of paraffin manufacture, was born in Glasgow, and became assistant to Professor Graham in that city (1831-2), and subsequently (1837) at University College, London. As manager of chemical works at Manchester (from 1844) he developed a new and cheaper method

of making sodium stannate. Young's success was the foundation of a world-wide paraffin industry. He founded Young's chair of technical chemistry, Anderson's College (1870), Glasgow, and was a friend of Lord Playfair and of Dr. Livingstone, to defray the cost of whose explorations he contributed liberally. See Wemyss Reid's *Memorials of Lyon Playfair* (1883); also *Journal of the Chemical Society* (1884).

Young, ROBERT (1822-88), Scottish Oriental and Biblical scholar, worked as a printer in Edinburgh. During five years (1856-61) he superintended the mission press at Surat, India, and on his return devoted himself chiefly to the authorship and issue of works on Biblical criticism showing thorough scholarship. From 1864-74 he was head of the Missionary Institute. Among his chief works are *Concise Critical Comments on the Holy Bible* (1865), *Grammatical Analysis of the Scriptures* (Hebrew, Chaldee, and Greek, 1885), and an *Analytical Concordance to the Bible* (1886).

Young, THOMAS (1773-1829), English physicist and Egyptologist, was born at Milverton, Somersetshire. He discovered the interference of light, thereby establishing the undulatory theory; but the theory was not generally accepted until re-advanced by Fresnel. In Egyptology Young was the first to publish a translation of the inscriptions on the Rosetta stone, and to discover the symbolic nature of some of the demotic (cursive) characters. These and other important conclusions were embodied by him in the article 'Egypt' in the *Encyclopædia Britannica* (1818 ed.). His *Course of Lectures on Natural Philosophy* (1807) remains a standard work. See Peacock's *Life* (1855), Gurney's *Memoirs* (1831), and Pettigrew in *Medical Portrait Gallery* (1840).

Young England, the epithet applied to a party of young Tory aristocrats opposed to the repeal of the Corn Laws and to other Radical measures (1839-46). They also aimed at a revival of the manners and customs of mediæval times. Lord John Manners (7th Duke of Rutland, 1818-1906), Cochrane Baillie, G. Smythe, and Benjamin Disraeli were among the leaders of the movement, which is illustrated in the last named's novel *Coningsby* (1844).

Young Europe, an international association of republican societies in various countries, formed about 1834, comprising such groups as Young Germany, Young Italy, Young Poland, Young France.

Young Germany, a school of letters organized in Germany after the emancipation of that country from the despotic rule of the first Napoleon. It endeavoured to reflect the political hopes and aspirations resulting from the spread of liberal ideas throughout Europe. The failure of the revolution of 1848 caused the dismemberment of the organization. Among the chief exponents of Young Germany were Heine, Börne, Gutzkow, Laube, Heller, and Kühne.

Younghusband, SIR FRANCIS EDWARD (1863), British Indian political officer, was born at Murree in India. In 1886 he travelled in Manchuria, and returned (1887) to India across Eastern Turkestan. After being British political officer at Hunza (1892) and at Chitral (1893-4), he was appointed political agent in Harauti and Tonk, Rajputana (1898), the interval having been partly occupied in the Transvaal and Rhodesia (1896-7). In June 1903 he was appointed the British commissioner for negotiating with China a settlement of the relations between India and Tibet, and was at the head of the expedition which in the following year forced its way to Lhasa. In 1906 he went to Kashmir as British resident there. He is the author of *The Heart of a Continent: A Narrative of Travels in Manchuria, across the Gobi Desert, through the Himalayas, the Pamirs, and Chitral, 1884-1894* (1896); *The Relief of Chitral* (1895); and *South Africa of Today* (1898).

Young Ireland, the name given to a political party in Ireland, founded in 1848 by Thomas Osborne, C. Gavan Duffy, Thomas Davies, and W. Smith O'Brien, with the object of uniting both Roman Catholics and Protestants in a supreme effort to separate Ireland from the British crown. It differed from the 'Old Ireland' party, which was organized on a sectarian basis, and sought the aid of Roman Catholics alone in the breaking of the union. The proceedings of the 'Young Ireland' party led to a number of state trials. See Duffy's *Young Ireland* (1880).

Young Italy, a political association formed at Marseilles in 1831 by Mazzini, the Italian agitator and patriot. It aimed at the creation of a free, independent, and united Italy, under a representative form of government. It ceased to be an active organization after 1848.

Young Men's Christian Association, better known as 'Y.M.C.A.', was founded in London in 1844 by George Williams, in St. Paul's Churchyard. The idea, however, had been put into

practice as early as 1632, when some of the apprentices in London met early on Sunday mornings for prayer and the study of God's Word. The movement spread, particularly in the Church of England, and at the beginning of the 18th century upwards of forty such societies were in existence. It was one of these, called in contempt 'the Holy Club,' 'the Bible Bigots,' or 'Methodists,' which met at Oxford, and, by attracting first Charles and then John Wesley, gave rise to the great Methodist revival. Its aim is to provide young men with the means of culture through special classes, and of innocent amusement through organized clubs, within premises that are recognized to be dominated by openly professed Christian influences. It has 7,773 centres, scattered throughout the world, with a total membership of 721,477. The buildings owned by the association number 828, valued at £6,876,594. The official headquarters are at Exeter Hall, Strand, London, which was purchased in 1881. The Young Men's Guild, the Guild of Christian Workers, and even the Christian Endeavour Association, are movements which, directly or indirectly, have emanated from the Y.M.C.A.

Young People's Society of Christian Endeavour. See CHRISTIAN ENDEAVOUR SOCIETIES.

Youngstown, city, Ohio, U.S.A., co. seat of Mahoning co., on Mahoning R., 65 m. S.E. of Cleveland. Its manufactures are principally iron and steel. Pop. (1900) 44,885.

Young Turk Party. See TURKEY.

Young Women's Christian Association, otherwise known as Y.W.C.A., is the twin organization of the Y.M.C.A., founded in 1855, and seeks the same ends in the moral, spiritual, and social well-being of young women. The British membership numbers 95,000, including 14,000 in London, while there are 300,000 members resident throughout the world. It has its headquarters at 26 George Street, Hanover Square, London. The GIRLS' FRIENDLY SOCIETY was founded for the purpose of drawing girls resident in great centres into closer union for mutual protection, and also mutual help in the way of obtaining situations, as well as 'for promoting purity, dutifulness, temperance, thrift, and fidelity.' Branches exist in the United Kingdom in 1,382 places, with a membership of 156,885, and the organization has been extended to the Continent, Australia, America, New Zealand, India, and Africa.

Ypres (Flem. *Yperen*), anc. tn., prov. W. Flanders, Belgium, 32 m. by rail S.S.W. of Bruges; has manufactures of lace and thread. The Cloth Hall and St. Martin's Church (formerly a cathedral) both date from the 13th century. Ypres was a flourishing linen-manufacturing town in the 14th and 15th centuries. Pop. (1900) 16,552.

Ypsilanti, city, Washtenaw co., Michigan, U.S.A., in Lower Peninsula, on Huron R., 30 m. W. of Detroit. Pop. (1900) 7,378.

Ypsilanti Family, a noble Greek family of Fanariot descent, originally from Trebizond, who acquired great wealth and influence at Constantinople. ALEXANDER (1725-1805) was governor of Walachia (1774-82 and 1790-2), and was put to death at Constantinople for plotting the deliverance of Greece from the Turks. His son CONSTANTINE (1760-1816) was governor of Moldavia (1799) and of Walachia (1802-5). After the treaty of Tilsit (1807) he went to Kiev in Russia, where he devoted himself to literature. His son ALEXANDER (1792-1828) entered the Russian service, fought against Napoleon in the campaign of 1812, took part in the Greek revolution of 1821, but was defeated by the Turks at Dragashan (N.E. of Craiova), and died in Vienna. His younger brother DEMETRIUS (1793-1832) assisted his brother to secure Greek independence. He behaved gallantly at Tripolizza (1820), but was unfortunate in the Morea in the campaign of 1821. However, in 1822 he was elected president of the Greek legislative council.

Yriarte, CHARLES ÉMILE (1832-98), French author, a native of Paris, became (1856) inspector of national buildings and (1862) editor of *Le Monde Illustré*. His works include *Goya* (1867), *Venise* (1877), *Florence* (1880), *Françoise de Rimini* (1882), *Matteo Civitani* (1885), *Paul Véronèse* (1888), *César Borgia* (1889), *Millet* (1885), *Fortuny* (1886), and *Autour des Borgia* (1890), most of them translated into English.

Ysaye, EUGENE (1858), Belgian violinist, was born in Liège, Belgium. He began to tour in 1878, first appeared in London in 1889, and for some years from 1890 was principal professor of violin in the Conservatorium at Brussels. He is regarded as one of the greatest living exponents of classical and virtuosic violin music.

Ysolde, or ISEULT. See TRISTAN.

Ysopet ('little Æsop'), the title in the middle ages of a collection of old French fables. The chief of these was that of Marie de France, who lived in England

in the reign of Henry III., and wrote a form of verse which was a link between the *Fabliau* and the *Roman de Renart*. The collection was edited by Roquesfort (1820). Another collection was the *Ysopet of Lyons*, edited by Förster (1882).

Ystad, seapt. tn., Malmöhus co., Sweden, on s. coast, 34 m. E.S.E. of Malmö; has sugar refineries, iron foundries, tobacco, match, and chicory factories, and shipbuilding, and exports molasses and eggs. Pop. (1900) 3,862.

Ystradryfodwg, or RHONDDA (since 1894), large par., Glamorganshire, 20 m. N.W. of Cardiff. It comprises several hamlets, extensively engaged in coal-mining. Area, 23,885 ac. Pop. (1901) 113,735.

Yttrium, Yt, 80·9, an element (sp. gr. 3·8) or possibly a mixture of elements, of the rare earths. It is characterized by its spark and phosphorescent spectrum, and is said to be a component of the 'glower' rods used in the Nernst incandescent electric lamp.

Yucatan, state of Mexico, in N.E. of peninsula of same name, covers an area of 35,203 sq. m. Agriculture and stock-raising are the chief industries. Sugar, tobacco, and vanilla are produced. Merida is the capital. Pop. (1900) 314,087.

Yucca, a genus of American plants belonging to the order Liliaceae. They bear many-flowered panicles of large showy flowers, and usually thick lanceolate leaves, clustered at the summit of the woody caudex. Many species are cultivated, either in the greenhouse or in the open air, a light rather rich soil being the desirable compost. *Y. filamentosa* and *Y. aloifolia* are known as 'Adam's needle' and 'Eve's thread' from their sharp pointed leaves with threads hanging from their edges.

Yuchi. See UCHI.

Yukaghirs, Siberian aborigines, a division of the Mongolic family. They are now reduced to about 1,500, centred chiefly in the Indigirka and Yana basins. The Yukaghirs have invented a curious symbolic graphic system, in which the signs are carved with a sharp knife out of fresh birch-bark.

Yukon. (1.) Territory of Canada, with an area of 196,976 sq. m., carved in 1898 out of the Mackenzie district for the purpose of administering the gold regions of the Yukon, which had been discovered in 1896. Steamers

ply regularly from Lake Bennet (on the frontier) to Dawson; and a railway runs from Skagway towards Fort Selkirk on the Pelly, 100 m. S.E. of Dawson. The gold fields, near Dawson, are known as Klondike. Pop. (1901) 27,219. (2.) River, N. America, in territories of Yukon and Alaska; has a drainage area of 440,000 sq. m., and is formed by the Lewes and Pelly Rs. It rises about 15 m. from Dyea inlet, and after passing through Lake Bennett flows w., with a big N. curve, to the Bering Sea, its length being 1,865 m. Steamers ascend the Yukon from the mouth to Dawson, and descend from Lake Bennett to the same town; the period of navigation lasts, however, only from the end of June till the end of September. The delta is fully 60 m. long.

Yule. See CHRISTMAS.

Yule, SIR HENRY (1820-89), British geographer, was born at Inveresk, near Edinburgh, and at twenty joined the Bengal Engineers. In 1855 he was made under-secretary to the Indian Public Works Department. His works include *Book of Ser Marco Polo* (1871; 3rd ed., with Memoir by his daughter, 1903), *A Narrative of the Mission to Ava in 1855* (1858), and *Hobson Jobson, a Glossary of Anglo-Indian Words and Phrases* (1885). He also brought out for the Hakluyt Society editions of *Mirabilia Descripta—the Wonders of the East*, by Jordanus (1863); *Cathay and the Way Thither* (1866).

Yumas, North American aborigines, who give their name to a distinct ethnical and linguistic family. They are called also Cuchans, and formerly occupied both banks of the Colorado above the river Gila confluence in Arizona and the San Diego district, California, but are now mostly located in California (700) and Arizona (700). In 1900 the natives of Yuma stock numbered altogether 1,400. See Latham's *Opuscula* (1860) and J. W. Powell's *Indian Linguistic Families* (1891).

Yün-nan, prov. China (Marco Polo's Caragan); area, 146,680 sq. m. N. Yün-nan consists of wind-swept downs, at an altitude of from 4,000 to 7,000 ft., between low ranges of mountains, and intersected by deep ravines, hiding rivers which not infrequently follow subterranean courses. Cart traffic exists, but roads are bad. In W. Yün-nan the country is more mountainous, the rivers are deeper, rendering communication across them almost impossible. On the s.w. and w. the descent

from the centre of the province is easier. Large lakes are not infrequent. Excellent crops are obtained of rice, maize, buckwheat, and other grains, but cotton has to be imported. Opium is largely cultivated and exported. The tin and copper mines are of well-tested repute. Coal and iron are common, and are easily obtained; galena, mercury, and gold are also found, and brine wells are worked. Commercially, the province naturally divides into four sections—viz., the area supplied from the Yang-tse-kiang and Hu-nan, from Canton and Kwang-si, from Tong-king by the Red R., and from Burma. The Mohammedan rebellion of 1857-73 paralyzed the province. Pop. (1902) 12,721,500.

Yuryev, or YURIEV, formerly DORPAT, tn., Livonia gov., N.W. Russia, 140 m. N.E. of Riga. It has a university (founded by Gustavus Adolphus in 1632, closed in 1710, reopened in 1802, Russified under Alexander III.), with about 1,700 students; an observatory; remains of old pagan citadel, afterwards the episcopal palace; a ruined cathedral, a fine example of northern Gothic brickwork, destroyed by fire in 1624; and a town hall, with the finest picture gallery in Baltic provinces of Russia. Pop. (1897) 42,421.

Yusafzais, an Afghan people, some semi-independent in the hills on the north-west frontier of British India, some settled in the Peshawar district. There are two main sections, Mandan and Yusuf. The total number is estimated at from 250,000 to 700,000. See A. H. Keane's 'Afghan Ethnology,' *Index Geographicus Indicus* (1881).

Yusuf-ibn-Tashfyn. See ALMORAVIDES.

Yverdon (Lat. *Eburodunum*), tn., Switzerland, canton Vaud, at s.w. end of L. Neuchâtel, 20 m. by rail N. of Lausanne. From 1805-25 Pestalozzi had an educational establishment in the 12th-century castle, now occupied by the municipal school, museum, and library. The watering-place of the same name is near by. Pop. (1900) 7,980.

Yvetot, tn., dep. Seine-Inférieure, France, 20 m. N.W. of Rouen; has manufactures of silk, linen, and cotton goods. Béranger, in satirical singing of Napoleon as 'le Roi d'Yvetot,' was making use of the usual designation of the lords of the tiny principality of Yvetot till 1681. Pop. (1901) 6,942.

Y.W.C.A., Young Women's Christian Association.

Z

Z represents voiced *s*. It has never been much used in English, except for foreign words; the sound *z* is generally represented by *s*. In 'azure' and other words *z* has the value *zh*. (See *S*.) The obsolete letter **Z** is a form of *g*. In the Greek and Semitic alphabets *z* is the seventh letter. It was the last addition to the Latin alphabet, and so put at the end. It was borrowed by the Romans to represent Greek words, and was rarely used by them. In the Greek alphabet it is believed to have had a compound value, both *dz* and *zd*. The early Semitic form is **𐤆**. **Z** is the same, written without lifting the pen. Hebrew

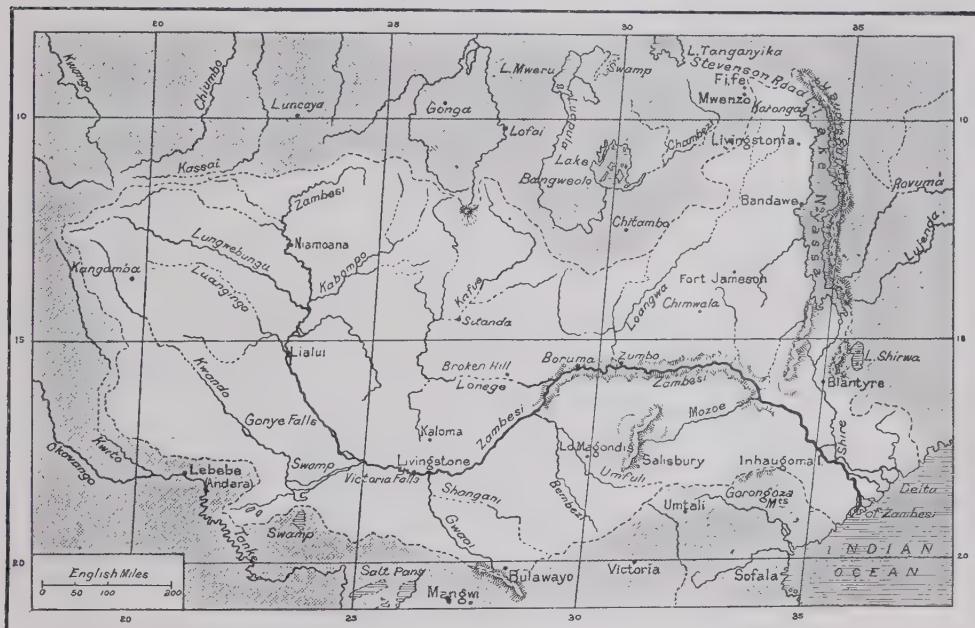
and later than the date of the Greek borrowing of the alphabet. In that case *zayin* is a later name; its meaning is uncertain. The root of the word *sade* means 'to fish.'

Zaandam, incorrectly SAARDAM, tn., Netherlands, prov. N. Holland, 6 m. by rail N.W. of Amsterdam; with oil mills, saw-mills, and factories for paper, cement, and colours. Here Peter the Great of Russia (1697) learnt shipbuilding. Zaandam was formerly the chief Dutch port for Greenland whale fishery. Pop. (1900) 21,146.

Zabians and Zabišm. See SABEANS.

Zadkiel, the name adopted by Richard James Morrison (1794-1874), a retired British naval officer, as the compiler of a prophetic *Almanac*, started in 1830, which soon commanded a very great sale. He was skilled in Hebrew, mathematics, astronomy, and occult science, especially the reading of the crystal ball. An attack upon him by Sir E. Belcher in 1863 resulted in an action for libel, in which he obtained 20s. damages.

Zafarines, or CHAFFARINAS, a group of three small islands, Morocco, 6 m. N.W. of the mouth of the Muluya. They belong to Spain, and are fortified.



Basin of the Zambezi.

Z has lost the lower stroke. The addition of a flourish has made *z* into *ſ*. French *ç* is a special form of *z*, as the name *cedilla* implies. The Greek name *zeta*, Latin and English *zed*, does not correspond to the Semitic name, which is *zayin*. It is the Semitic name for the eighteenth letter of the alphabet, *sade*, which the Greeks called *san*. It is generally assumed that the Greeks confused the names of the sibilants and dropped the name *zayin*. It is, however, open to suppose that the Semites altered the name of *san* to *sade* after it was completely differentiated from *shin*,

(8)

Zacatecas, tn., cap. of state Zacatecas, Mexico, 115 m. N.W. of San Luis Potosi; contains a cathedral, mint, and institute of sciences. The chief industry is the reduction of silver ore. Pottery is made. Pop. (1900) 39,912.

Zacharias, POPE (741-752), a Greek by birth, succeeded Gregory III. He was a man of great ability and piety and strong personal magnetism. He impressed his authority on Liutprand and Ratchis, kings of the Longobards, and was instrumental in the deposition of Childeric III. in favour of Pepin (Pippin).

Zacynthus. See ZANTE.

Zaffre, a crude oxide of cobalt, obtained by heating cobalt ore in a current of air. It is used to prepare smalt and stain glass blue.

Zagazig, tn., cap. of prov. Charkieh, Lower Egypt, 40 m. N.N.E. of Cairo, the centre of cotton and grain trade. Pop. (1897) 35,715.

Zagoskin, MIKHAIL NIKOLAEVITCH (1789-1852), Russian dramatist and novelist, born at Ramzay, Penza; was at first a government clerk in St. Petersburg, then joined the army, was wounded at Potolsk, and was present at the siege of Danzig. His comedy

Prokaznik ('The Wag') was a great success. He wrote a number of plays, and a romance which caused some sensation—*Yuri Miloslavsky* (1829; Eng. trans. *The Young Muscovite*, 1834). A second novel, *Rostarlev*, was, however, a failure. In 1820 he was appointed director of the theatre at Moscow, and in 1842 director of the armoury of the Kremlin.

Zagreb, Croatia. See AGRAM.
Zagreus, in Greek mythology, the name of the Dionysus of the mysteries; he was begotten by Zeus in the form of a dragon from Persephone. Zeus made him ruler of the world, but the Titans

Neutestamentlichen Kanons (6 vols. 1881-1900)—this includes the *Diatessaron* of Tatian—and *Geschichte des Neutestamentlichen Kanons* (1888-92). He has written, further, *Einleitung in das Neue Testament* (2 vols. 1897-9), *Skizzen aus dem Leben der alten Kirche* (1894), and *Epiktet* (1893).

Zaire. See CONGO.

Zaleucus, the earliest law-giver of ancient Greece, belonged to the city of Locri Epizephyrii in S. Italy. His legislation probably dates in the 7th century B.C.

Zama, tn. in Numidia, N. Africa, situated some 75 m. s.w. of Carthage; the scene of Scipio's decisive victory over Hannibal in

From this point the river flows north-east and east for 900 m. to the Kebrabasa Falls in Portuguese territory, where it descends from the central plateau at a distance of 400 m. from the sea. In its lower course it receives the drainage of Lake Nyasa by the Shire R., and, running south-eastwards through low country, enters the Indian Ocean by seven chief branches, the most important being the Chinde R. Sandbanks are troublesome, but stern-wheel steamers ply up to Tete, and to Chiromo on the Shire R. The middle river is also navigable for vessels of small draught.



Railway Bridge at Victoria Falls, Zambezi River.

tore him in pieces; Athena then took his heart to Zeus. Zeus swallowed it, and afterwards brought forth the new Dionysus. The Titans were consumed by the lightning of Zeus; from their ashes sprang the race of men.

Zahn, THEODOR (1838), German theologian, was born at Mörs in Prussia. He became professor of theology in Kiel (1871), in Erlangen (1878), and in Leipzig (1888). His works on the canon of the New Testament have gained him a high reputation. He was joint-editor with Gebhardt and Harnack of the *Patrum Apostolicorum Opera*, in 3 vols. (1876-8). His works on the canon are *Forschungen zur Geschichte des*

201 B.C., which ended the second Punic war.

Zambezi, a large river of south-central Africa. Rising on the border of the Congo Free State, in lat. 11° 21' 3" S. and long. 24° 22' E., approximately, at an altitude of nearly 5,000 ft., it flows south and south-east through north-western Rhodesia for fully 600 m. to the Victoria Falls, a mighty cataract, much larger than Niagara, being 1,860 yds. broad and 400 ft. high. A scheme to harness the falls and supply electrical power to the Rand is in contemplation. The gorge below is spanned by a railway bridge (opened Sept. 12, 1905) 650 ft. long and 420 ft. above river-level.

Zambezia, a district of Mozambique, or Portuguese E. Africa, occupying the basin of the lower Zambezi. Formerly it extended inland to the limits of Portuguese territory, but upper Zambezia has been detached and formed into the district of Tete. The capital of Zambezia is Quilimane, on the Kwakwa R. As a port it has lost much of its importance, while Chinde, on a mouth of the Zambezi, is progressing.

Zamia, a genus of tropical, palmlike plants belonging to the order Cycadaceæ. They are natives of the W. Indies and of S. and Central America. They bear pinnate leaves, few in number.

They are often cultivated in the stove, a light, peaty soil being required.

Zamora. (1.) Province, Spain, on the Portuguese frontier, drained by the Douro and its tributaries; entirely agricultural—the wheat being considered the best in Spain, and the wine highly esteemed. Area, 4,097 sq. m. Pop. (1900) 275,545. (2.) City, cap. of above prov., 40 m. N. of Salamanca; very ancient walled city on Douro R. It has a considerable trade in wine, wheat, and coarse linens. Pop. (1900) 16,287.

Zamosc, tn., Lublin gov., Russian Poland, 50 m. S.E. of Lublin city; with a fine castle, and houses in the Italian style. Formerly it was one of the strongest fortresses in Poland. Pop. (1897) 12,400.

Zanardelli, GIUSEPPE (1826-1903), Italian statesman, born at Brescia; served in the wars of 1848-49 and 1859. In 1861 he was elected a deputy, became minister of public works (1876) and of the interior (1878). He retired from politics to publish the *Avvocato*, but was afterwards appointed minister of justice (1881-3 and 1887-91). The new Italian penal code (1890) was chiefly due to him. He was president of the Chamber (1891-4 and 1898), and afterwards president of the Council (1901-3).

Zancle. See MESSINA.

Zandeh, or A-ZANDEH. See NIAM-NIAM.

Zandvoort, seaside resort, Netherlands, prov. N. Holland, on North Sea, 6 m. by rail W. by S. of Haarlem. Pop. (1900) 3,168.

Zanella, GIACOMO (1820-88), Italian poet and literary historian, was born at Chiampo, near Vicenza, and was engaged in teaching till 1866, when he was called to the chair of Italian language and literature at Padua. He retired in 1876. Those of his poems which aroused most curiosity are the ones dealing, not altogether successfully, with various subjects of a scientific kind (fossils, nature, and science, the Suez Canal); others, however, are marked by beauty of style and great tenderness. Moreover, he greatly distinguished himself as a translator from the Bible, classics, and moderns (best edition of these *Versioni*, 1887). He wrote the history of Italian literature in the 18th and 19th centuries (1885). A *Life of A. Palladio* and an interesting volume on literary parallels also deserve mention. See the preface by Lampertico to the edition of the *Poesie* (1884).

Zanesville, city, Ohio, U.S.A., co. seat of Muskingum co., on Muskingum R., 55 m. E. of Columbus. It has various industries. Pop. (1900) 23,538.

Zangwill, ISRAEL (1864), English writer, became a teacher in Spitalfields, and subsequently a journalist. He has written novels, essays, poems, and plays, and distinguished himself as a Zionist lecturer. Among his general works are *The Premier* and the *Painter* (1888); *The Bachelors' Club* (1891); *The Big Bow Mystery* (1892); *The Old Maids' Club* (1892); *Children of the Ghetto* (1892); *Ghetto Tragedies* (1893); *The King of Schnorrers* (1894); *The Master* (1895); *Dreamers of the Ghetto* (1898); *The Mantle of Elijah* (1900). Among his plays are *Six Persons* (1892); *Children of the Ghetto* (1899); *The Moment of Death* (1900); *The Revolted Daughter* (1901); and *Merely Mary Ann* (1904). He is honorary president of the Jewish (Zionist) Territorial Organization for colonizing British E. Africa.



Israel Zangwill.

(Photo by Russell & Sons.)

Zante (anc. *Zacynthus*), cap. of isl. of same name, Ionian Is., Greece, on E. coast; has manufactures of carpets, and of gold and silver articles. The island, known as the 'Golden Island,' is very subject to earthquakes; it exports currants and olives. Area, 277 sq. m. Pop. (1896) of isl. 45,032; of tn. 14,650.

Zanzibar. (1.) Sultanate under British protection, a ten-mile-deep strip of the coast of British E. Africa, from the mouth of the Umbu to Kipini on the Ozi, together with the isls. of Zanzibar, Pemba, and others, and the mainland town of Kismayu. The chief ports are Zanzibar, Mombasa, and Kismayu. Exports (1905), £1,120,650; imports, £1,109,956. Cloves and copra are the principal exports. The Imams of Muscat made themselves masters of Zanzibar be-

tween 1698 and 1807. Area, 1,020 sq. m. Pop. 200,000. (2.) Island, off East African coast, separated from German E. Africa by a channel 20 m. wide. It has an area of 640 sq. m. It is traversed from N. to S. by undulating hills, rising to nearly 900 ft. in the N., and is exposed to the full influence of the Indian Ocean. The mean yearly temperature is about 80° F., and the mean annual rainfall 61 in. The heat is oppressive only in December and January. The chief crops are sorghum, rice, cloves, chillies, and coconuts. There is also a promising cultivation of tea, coffee, and vanilla. The population is estimated at 150,000. (3.) Town, cap. of isl. of Zanzibar, the principal port on the E. coast of Africa, on a low-lying peninsula, projecting from the W. coast. The buildings include the sultan's palace, a French hospital, the English hospital, an English church, Hindu temple, the old fort, and a government ship-repairing factory. Formerly a centre of the slave trade, Zanzibar was a free port from 1892 until 1899. Pop. 50,000 to 60,000.

Zaparos, South American aborigines, formerly powerful in Ecuador. Although described as docile, hospitable, and friendly to Europeans, the Zaparos are in a state of continual feud amongst themselves, combining only against the Jivaros and other enemies. Physically they are of somewhat Mongolic aspect, with round, flat features, small, oblique-set eyes, small, thick nose and lips, beardless chin, and light coppery colour. They speak a stock language of simple structure.

Zapolya, or ZAPOLY, Hungarian family. STEPHEN (d. 1499) distinguished himself under Matthias Corvinus, succeeded in expelling the son of Casimir IV., king of Poland, who endeavoured to secure the throne of Hungary, defeated the Turks and the imperialists, and became governor of Austria (1483). His son JOHN (1487-1540), voivode (1510) of Transylvania, quelled the revolt under Dosza (1514), and was proclaimed king of Hungary (1526). Defeated by Ferdinand of Austria (1528), he fled to Poland, but made peace (1538). His son JOHN SIGISMUND (d. 1571), who succeeded in 1540, was forced (1551) by Sultan Solymán to change his title of king for that of voivode of Transylvania, and abdicated in 1570.

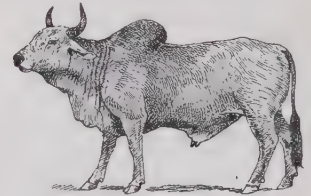
Zaporogians. See COSSACKS. **Zapotecs,** one of the chief civilized nations of Mexico, who in pre-Columbian times were a powerful kingdom in the present state of Oajaca, which, however, was overthrown by the

Aztecs towards the close of the 15th century. Their general culture is attested by the ruins of their palace at Mitla, one of the very finest monuments in the New World. They are still numerous in E. Oajaca, where they speak a cultivated and highly polysynthetic stock language.

Zara (anc. *Iadera*), seapt. tn. and cap. of Dalmatia, Austria, on the Adriatic, 72 m. N.W. of Spalato; has manufactures of maraschino and glass. There are Roman remains; the cathedral dates from the 13th century. Zara gives title to an archbishopric of the Roman Catholic Church, and to a bishopric of the Ortho-

Zealots, a Jewish party which originated in the reign of Herod the Great. Josephus (*Ant.* xviii. 1, 6) calls them the fourth party (besides the Pharisees, Sadducees, and Essenes), that of the nationalists, who revived the Maccabean movement. Their headquarters were the Galilean highlands. A strong party in the Sanhedrin was in sympathy with their aspirations. Ezekias, the leader of the Zealot guerilla bands, was executed by Herod; but Judas, one of his sons, again raised the standard of revolt on the accession of Archelaus. Twice he failed, and his two sons were crucified (46). A third son, Mena-

(*Equus zebra*), also called the true zebra, was formerly common in the mountain regions of Cape Colony, but is now confined to certain protected districts in the east. It stands a little over four feet at the shoulder, and is striped over head, legs, tail, and body, with the exception of the under surface and the inner side of the thighs. The stripes are broad, and are black on a white ground. Burchell's zebra (*E. Burchelli*), sometimes, but erroneously, called the quagga, is a plain-dwelling animal, found to the north of the Orange R. In the typical form stripes are absent on the limbs and tail, and there are certain peculiarities in the direction of the stripes. In Shoa and Somaliland there occurs a third species (*E. Greyi*), formerly confused with the mountain zebra, from which it differs in the height (four feet at the shoulder), and in the great number of the narrow stripes, which occur over the limbs and tail as well as on the body. Zebras have been domesticated, though with considerable difficulty. They will interbreed alike with the horse and the ass. See Cossar Ewart's *Peniculi Experiments* (1899), and *Guide to Zebras, Hybrids, etc.* (1900).



Zebu.

Zebu (*Bos indicus*), the domesticated ox of India, which differs from the European ox in the presence of a large hump on the withers, the large drooping ears, the enormous dewlap, as well as in coloration and habits. It is usually ashy-gray, but cream, white, and even black varieties occur, as well as forms showing reddish tints. The disposition is gentle, and in India the animals are used for draught purposes. The sacred bulls of India, known as Brahman oxen, which are allowed to wander freely about the bazaars, belong to this species. Humped cattle, which are at least closely related to the zebu, occur in Africa, Madagascar, and China. The voice in all varieties is a grunt; and there is great variation in size.

Zebu. See CEBU.

Zechariah. The original prophecy is in ch. 1-8, and was written by a grandson of Iddo,



dox Greek Church. Pop. (1900) 32,506.

Zaraifshan. See ZERAFSHAN.

Zaragoza. See SARAGOSSA.

Zarathushtra. See ZOROASTER.

Zarskoe. See TSARSKOE SELO.

Zea. See CEOS.

Zea, FRANCISCO ANTONIO (1770-1822), Colombian naturalist, born at Antioquia; was one of the founders of the republic of Colombia, of which he was vice-president. From 1820 to 1822 he was the agent of the Colombian government in England.

Zea Grain. See MAIZE.

Zealand. See SJÆLLAND and ZEELAND.

hem, who was chief of the Sicarii, the most fanatical section of the Zealots, died under torture; while Eleazar, a fourth son, was slain in battle. Simon, one of the twelve apostles, once belonged to the party of the Zealots (Luke 6:15).

Zebra, the type of a group of striped horselike animals, peculiar to the African continent. In having callosities on the fore limbs only, in the characters of the tail, ears, and hoofs, the zebras approach the asses more nearly than the true horses; but they differ from the asses in the extensive striping of the head and body. The mountain zebra

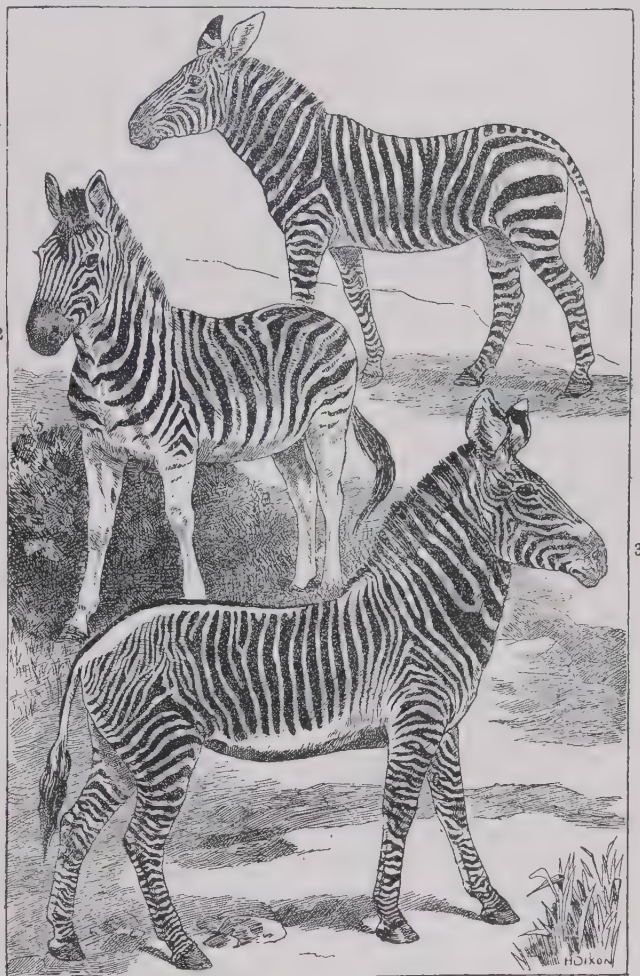
the head of a priestly family which returned from the exile. Like Haggai, Zechariah began his work in the second year of Darius Hystaspis (520 B.C.). He found the community at Jerusalem discouraged by the difficulties which they met after the return from exile, and neglecting the restoration of the temple because of their temporal wants. Zechariah urged the continuation of this task as the condition of Jehovah's help, and cast his encouraging view of the future into the form of visions. In these he foretold the advent of a Messianic king (whom he perhaps identified with Zerubbabel). Ch. 9-14 contain a collection of minor prophecies. It is still doubtful how many writers contributed to these, and at what period they wrote. The following sketch must be taken as purely tentative:—Ch. 9:1-11: 3. This belongs to the period after Alexander the Great, not earlier than 333 B.C. The word of Jehovah is uttered against Asshur and Egypt—i.e. the Seleucid empire. A Messianic king with a more spiritual work is foretold. Ephraim—i.e. the tribes of the Diaspora—will be restored. Ch. 11: 4-17; 13: 7-9. All that can be said of the date of this fragment is that it is post-exilic. It deals with the inward condition of the community, about which we know little. The shepherds are the native authorities, especially the successive high priests. Ch. 12: 1-13: 6, post-exilic. It shows a separation appearing between Judah and Jerusalem. Ch. 14. Later in date than Malachi, and apocalyptic in character. See C. H. H. Wright's *Zechariah and his Prophecies* (1879); K. Marti's *Der Prophet Zacharia der Zeitgenosse Serubbabels* (1892); G. A. Smith's *The Book of the Twelve Prophets*, vol. ii. (1898); W. Nowack's *Die Kleinen Propheten* (1892).

Zechstein, the name given in Germany to the Upper Permian. Its principal member is the Zechstein limestone, which contains many fossil shells belonging to such genera as *Productus*, *Spirifer*, *Strophalosia*, and *Camarophoria*. The copper slate, or Kupferschiefer, which lies beneath the limestone, is a black shale, impregnated with copper ore, and often crowded with remains of fishes and plants, which have been replaced by deposits of copper salts. In the Zechstein, especially in N. Germany, near Stassfurt and Sperenberg, there are enormously valuable deposits of rock salt, with gypsum, carnallite, and kainite. The Magnesian Limestone of the N.E. of England is at the same horizon as the Zechstein.

Zedekiah, the last king of Judah (597-535 B.C.), was the son of Josiah. A vassal of Nebuchadnezzar, he coquetted with Egypt, and so brought about the ruin of Jerusalem and his kingdom (2 Kings 24). Two false prophets likewise bore the ill-fated name—the opponent of Micaiah under

leaves. Stove heat is required for its cultivation in Britain. The tubers should be repotted in spring in a light loam, to which peat and leaf mould have been added.

Zeehan, tn., Montagu co., Tasmania, Australia, the centre of the silver-lead mining district,



Species of Zebras.

1. Mountain zebra. 2. Burchell's zebra. 3. Grey's zebra.

Ahab (1 Kings 22:11-24), and a co-exile of Jeconiah, denounced by Jeremiah (Jer. 29:21 f.).

Zedoary (*Curcuma zedoaria*), a Himalayan herbaceous plant belonging to the order Scitamineae. It is a handsome plant bearing carmine-tinged white bracts above, green bracts below, yellow flowers, and variegated

25 m. N. of Macquarie harbour; has smelting works. Pop. (1901) 5,014.

Zeeland, prov. Netherlands, adjacent to North Sea, consists of a group of islands at the mouths of the Maas (Meuse), Waal, and Scheldt (Schelde)—viz. Schouwen, Walcheren, N. and S. Beveland, Tholen, and some smaller

ones. These islands, lying for the most part below sea-level, are protected by dikes and embankments. Over 220,000 acres have been won back from the sea by endiking. The soil is very fertile. Fishing is carried on. Cap. Middelburg. Area, 689 sq. m. Pop. (1900) 216,295.

Zeerust, tn., Marico co., Transvaal, Brit. S. Africa, 140 m. w. of Pretoria. Pop. (1904) 1,942.

Zeitun, tn., vilayet, Aleppo, Asiatic Turkey, in a gorge in the Taurus Mts., 25 m. N.N.W. of Marsh; has iron mines. Pop. 10,000.

Zeitz, tn., prov. Saxony, Prussia, on r. b. of Weisse Elster, 23 m. S.W. of Leipzig; has manufactures of cotton and woollen goods, machinery, pianofortes, etc. Pop. (1900) 27,391.

Zelle, Hanover. See CELLE.

Zeller, EDUARD (1814), historian of philosophy, was born at Kleinbottwar in Württemberg. He was (1847) appointed professor of theology at Bern; taught theology at Marburg in 1849. In 1862 he became professor of philosophy at Heidelberg, and was transferred to Berlin in 1872. His *Philosophie der Griechen* (4th ed. 5 vols. 1879-92) established itself as a standard work, and was translated into English (1868-83) under various titles. He also wrote *D. F. Strauss* (1874) and *Friedrich der Grosse als Philosoph* (1886).

Zemindar, literally a landholder: a Persian word introduced into Hindustan by the Mohammedans. A number of villages formed a district, the head man of which was called a *zemindar*. The chief business of the zemindar was to collect the revenues for the government. At present, in Bengal, the zemindars have all the rights of a British landed proprietor, subject to the payment of the land-tax.

Zemstvo, the elective district assembly in Russia, founded in 1864 by Alexander II. There are two zemstvos, the smaller being concerned only with the affairs of a single district, while the larger is elected by the zemstvos of all the districts in a province or government. District zemstvos are indirectly elected, and are made up of nobles and peasants in about equal numbers, together with a few merchants. They meet for about fifteen days once a year. Provincial zemstvos are composed wholly of members of the upper classes. Nominally representative and independent in the administration of their districts, they are yet under direct state control, and the governor of the province has a veto on all resolutions of both bodies.

Zenana, in India the portion of the native house reserved exclusively for the women, thus corresponding to the Moslem harem. Zenana missions were founded in 1852 to aid the women of India, by means of Protestant female missionaries, and especially female medical missionaries.

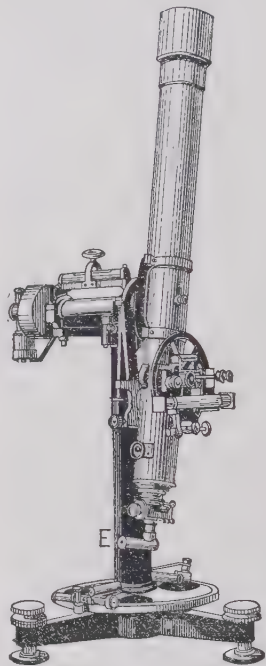
Zend. Some authorities apply this term to the ancient Iranian language in which the *Avesta*, or sacred writings of the Zoroastrians, was written. Other authorities assert that Zend is not the name of a language, but means a 'commentary' or translation—*Zend-Avesta* meaning a commentary on the *Avesta*, not the language of the *Avesta*. No name for the language of the Parsee scriptures has yet been found in the Parsee books. The word is generally applied to some Pahlavi translation, commentary, or gloss. The language which now passes by the name of Zend is also called old Bactrian and Eastern Iranian, related to old Persian, and forming, with other Iranian and Indian languages (e.g. Sanskrit), the Aryan or Indo-Iranian group.

Zend-Avesta, the sacred books of the Parsees. Mingled with treatises on astronomy, medicine, botany, agriculture, philosophy, etc., these books contain prayers, moral precepts, and rules of conduct. The original work is supposed to have been destroyed, either during the invasion of Persia by Alexander the Great or immediately after the conquest of the country by the Arabs. The books have since been re-collated and revised. There is an edition of the text by Geldner (1886-94), an Eng. trans. in *Sacred Books of the East* (vols. iv., xxiii., xxxi.), and a German trans. by Bartholomae (1905).

Zenith, the point of the celestial sphere vertically above the spectator. Zenith distance, which is complementary to altitude, is the angular space between the zenith and a celestial object. Sir George Airy invented a reflex zenith tube, chiefly for observing the Greenwich zenith star, γ Draconis, in which the image was viewed by reflection from a surface of mercury. The zenith telescope, devised by Talcott in 1834, is chiefly a geodetical instrument. It serves to determine geographical latitudes by Talcott's method, which depends upon measurements of the zenith distances of pairs of stars crossing the meridian north and south of the zenith. Designs for horizontal zenith telescopes, fed by plane mirrors inclined 45° to the horizon, were published by MM. Cornu and Lippmann in 1901-2.

Zenker, FRIEDRICH ALBERT VON (1825-98), German physician,

a native of Dresden, became professor of pathological anatomy and general pathology at Dresden (1855) and at Erlangen (1862). He is celebrated as the discoverer of trichinosis at Dresden in 1860. He was the first to make known the degeneration of striated muscular fibre in typhus.



Zenith Telescope.
E. Eyepiece.

Zeno. (1.) Ancient Greek philosopher of the Eleatic school, was a native of Elea (Velia) in southern Italy, and a pupil of Parmenides. He was born about 490 B.C. At the age of forty he went to Athens, and is said to have taught Pericles and Callias. None of his philosophical writings remain. Aristotle calls him the father of dialectic or logic. He made use of famous paradoxes, such as that of Achilles and the tortoise, to prove that motion is an illusion of the senses. (2.) ZENO (c. 360-270 B.C.), founder of the Stoic philosophy, was a native of Citium in Cyprus. He is said to have taken up his residence in Athens; opened a school in the porch, or rather colonnade, adorned by the paintings of Polygnotus—the *Stoa Poikile*—whence his disciples were called Stoics. He was a friend of Antigonus Gonatas, king of Macedonia. None of his works are extant. His threefold division of philosophy into ethics, physics,

and logic, and still more the practical application of philosophy to conduct, were the novelties of the Stoic teaching. It is difficult to distinguish the precepts of Zeno himself from the additions of his successors Cleanthes and Chrysippus; but he seems to have laid down the main principles of Stoicism. (See STOICISM.) (3.) Emperor of the Eastern empire at Constantinople from 474-91 A.D., was a native of Isauria. In 475-7 he was expelled by an insurrection. His reign was remarkable chiefly for wars with the Goths and the establishment of the Gothic kingdom of Italy under Theodoric. See also BYZANTINE EMPIRE.

Zeno, APOSTOLO (1668-1750), Italian poet and literary historian, was born at Venice. After founding the *Giornale de Letterati d'Italia*, with Maffei and Valisnieri (1710 sq.), and preparing his edition of the Venetian historians (1718-22), he became till 1729 court poet and historiographer of the emperor Charles v. For him he wrote most of his sixty melodramas (1st ed. 1744; 2nd ed. 1795). These play an important part in the history of Italian opera, fixing the form of the melodrama for musical purposes. He wrote notes to Fontanini's *Bibliot. dell' Eloq. Ital.* (1750); biographies of Sabellico, Guarini, Davila, and the three Aldi; and a supplement (1752-3) on Voss's work on the Latin historians. See Pistorelli's *I Melodrammi di A. Z.* (1894), and Menghi's *Lo Z. e la Critica Letteraria* (1901).

Zeno, NICCOLÒ (1340-91), Venetian explorer. Leaving Venice (1390), he was stranded on the 'island' of Friesland (i.e. Faroe Is.). Then, with his brother Antonio, he made various expeditions, on one of which they reached Greenland. Niccolò also sailed to Esthland (Shetlands) and Iceland, and died in Friesland. His brother Antonio (d. 1406), after his return from Greenland, spent fourteen years in Friesland, but died in Venice. An account of their voyages was published in 1558.

Zenobia, wife of Odenathus, prince—afterwards called king—of Palmyra (Tadmor in Syria); her native name was Bat Zabbai. Odenathus fought against the Persians on behalf of the emperor Gallienus. After his death, in 266 or 267, Zenobia ruled, and conquered Egypt. Then, aiming at complete independence of the Roman empire, she was defeated by Aurelian at Hemesa (272) and herself captured. Shortly afterwards Aurelian destroyed Palmyra, razing its walls. Zenobia was taken to Rome, but was allowed to live near Tivoli.

Zenodotus (c. 325-234 B.C.) of Ephesus, was made the first librarian of the great library at Alexandria by Ptolemy Philadelphus. He classified the Greek epic and lyric poets, compiled a glossary of Homer, and was the first critical editor of the Homeric poems.

Zenta, tn., Bács co., Hungary, on r. bk. of Theiss, 33 m. by rail s. of Szegedin, was the scene of the defeat of the Turks by Prince Eugene on Sept. 11, 1696. Pop. (1900) 28,588.

Zeolites, a group of minerals, which consist chiefly of hydrous silicates of aluminium, sodium, and calcium. They lose their combined water readily, some of them in dry air at ordinary temperatures (laumontite), others when warmed, and all give off water freely, and seem to boil when heated before the blow-pipe. They mostly occur well crystallized, and are secondary products of the decomposition of the feldspars and feldspathoids of igneous rocks. Very fine specimens are obtained from veins and cavities in the basalts and similar rocks of Iceland, Faroe, W. Scotland, Bohemia, India, the Cape. Among the best known are analcite, laumontite, natrolite, stilbite, and chabazite. Their specific gravity is always low (about 2.2), their hardness usually from $3\frac{1}{2}$ to 5.

Zephaniah, a Hebrew prophet, the great-great-grandson of King Hezekiah, who lived and prophesied in Jerusalem in the reign of Josiah. His prophecy was probably uttered before 621 B.C., when the reformation of Jewish religion was carried out. He anticipates an overwhelming ruin from invaders—probably the Scythians, who passed along the Philistine coast in 626 B.C. See S. R. Driver's *Introduction to Old Testament Literature* (6th ed. 1897); A. B. Davidson's *Cambridge Bible* (1896); Nowack's *Die Kleinen Propheten* (1899); and W. R. Smith's 'Zephaniah' in *Encyclopædia Britannica* (9th edition).

Zephyrus, in Greek mythology, the west wind, personified as a son of Astræus and Eos, and brother of Boreas, the north wind.

Zerafschan, riv., Russian Central Asia, in West Turkestan, formerly a tributary of the Oxus. It rises in the Alai section of the Tian-shan, and flows generally w.n.w. past Samarkand; and then, describing a sort of curve around Bokhara city, is lost in the sands 58 m. N.E. of the Oxus. The length is about 470 m.; its basin-area 15,000 sq. m.

Zerbst, walled tn., duchy of Anhalt, Germany, 22 m. S.E. of Magdeburg; has manufactures of beer, machinery, and starch. Pop. (1900) 17,095.

Zermatt, vil. (5,315 ft. above sea-level) at foot of Monte Rosa and the Matterhorn, in the Swiss canton of Valais. It is one of the chief resorts of travellers in summer, and is 22 m. by rail from Visp (Viège) in the Rhone valley. Pop. (1900) 765.

Zero represents the entire absence of the particular quantity that is in consideration, and is thus used incorrectly in the case of the temperatures 0° C. and 0° F. From observations of the contraction of gases when cooled, and from thermodynamical considerations, a body at a point approximately represented by -273° C. or -459° F. is really at the zero of temperature, as at this point it is believed that bodies are entirely devoid of heat. See GASES AND VAPOURS and THERMODYNAMICS.

Zetland. See SHETLAND.

Zeuglodonts, extinct fossil whales, represented by the single genus Zeuglodon, an animal which attained a length of over sixty feet, and is found in Eocene beds in England, N. America, France, Russia, and Egypt. It had a long narrow skull, with powerful jaws, which were provided with teeth, conical in front, but sharp-edged and adapted for cutting behind. The neck vertebrae were not fused together, the nasal bones were long; and these characters, together with the presence of two distinct kinds of teeth, show that they were more primitive than existing whales.

Zeugma, a figure of speech, in which one verb or verbal expression is used with two objects, the second of which necessitates the understanding of a different verb—e.g. 'to burn the ships and the men'—i.e. 'to burn the ships and kill the men.' It is often used in Greek and Latin, and also in English, often with a comic effect, as in Dickens's 'She went home in a flood of tears and a sedan chair.'

Zeuss, JOHANN KASPAR (1806-56), founder of Celtic philology, born at Vogtendorf in Bavaria; was appointed professor of philology at Bamberg (1847). His principal writings were *Die Deutschen und die Nachbarstämme* (1837), *Die Herkunft der Bayern von den Markomannen* (1839), and a work which secured for him world-wide reputation for scholarship—*Grammatica Celtica* (1853; 2nd ed. 1868-71).

Zeuxis (fl. 425-400 B.C.), Greek painter, was a native of Heraclea, on the Euxine. None of his works survive, but many stories testify to his marvellous power. Aristotle criticised his pictures as wanting in character—that is, in the expression of moral sentiments. His most famous picture was his *Aphrodite*; others were the *Infant Hercules Strangling the Serpents*, and *Zeus Enthroned*.

Zeyla, tn., British Somaliland, on Gulf of Aden, 140 m. s.w. of Aden, is a caravan centre for Abyssinia. Coffee, hides, and gums are exported. Pop. 15,000.

Zeyst, vil., Holland, prov. Utrecht, 5 m. E. of Utrecht; has manufactures of soap and candles. It has been a seat of the Moravian Brethren since 1746. Pop. (1900) 8,717.

Zgierz, or ZGERJ, tn., Piotrkow gov., Russian Poland, 6 m. N.N.W. of Lodz, with textile industries. Pop. (1897) 19,124.

Zheleznovodsk, a spa in northern Caucasus, Russia, 11 m. N. of Pyatigorsk. The water is impregnated with iron.

Zhitomir. See JIROMIR.

Ziani, Venetian family. SEBASTIANO (d. 1179), doge of Venice, was elected in 1172. He successfully reorganized the finances of Venice, and aided in the negotiations for peace between the pope and the emperor Frederick I., after the battle of Legnano. He renounced the dogship (1178) and retired to a monastery. His son, PIETRO, elected doge in 1205, held the dignity for twenty-three years.

Zibet. See CIVET.

Zichy, EUGEN, COUNT (1837), Hungarian explorer, born at Zichy-falva, was elected deputy of the Hungarian Parliament (1861), as a supporter of Deák, and organized four expeditions into Central Asia and the Caucasus to trace the origin of the Hungarians. The results were published in a work in three volumes (1897).

Zichy, MICHAEL (1827), Hungarian painter, was born at Zala. During the Hungarian campaign (1848) he was commissioned by the Emperor Nicholas of Russia to paint the principal episodes of the war, after which he was appointed court artist (1859) in St. Petersburg. His chief works are executed in water-colour, among them *Luther at Worms*, *A Florentine Orgy*, and the *Death of King Candaulus*.

Ziegler, JAKOB MELCHIOR (1801-83), Swiss geographer, born at Winterthur, was appointed lecturer in mathematics in his native town (1828-34). With his pupil Wurster he produced a large number of maps and atlases, notably *Atlas über alle Teile der Erde nach Karl Ritter's Lehre* (2nd ed. 1864); *Hypsometrischer Atlas* (1856); and a treatise, *Ueber das Verhältnis der Topographie zur Geologie* (1869-76). See Geilfuss's *Leben des Geographen J. M. Ziegler* (1884).

Zieten, HANS JOACHIM VON (1699-1786), Prussian general, born at Wustrau, near Ruppin, served in the wars of Frederick the Great, distinguishing himself especially at Moldau-Tein (1744),

and Hohenfriedeberg (1745); he took a leading part in the Seven Years' war, gaining renown at Prague (1757), Kolin, Leuthen (1757), Liegnitz (1760), and Torgau (1760). See *Winter's Life*, in German (1885).

Zillerthal Group. See TYROL, ALPS OF.

Zimbabwe, GREAT, collection of ruins, S. Africa, 17 m. from Fort Victoria, S.E. Mashonaland. Some of the walls are 35 ft. high, and in some places 16 ft. thick. According to one theory the buildings were erected by some Semitic race—possibly the Sabaeans from S. Arabia—as a stronghold and as a place for smelting and purifying ores. According to another theory (Randall-MacIver's), they are contemporary with medieval Europe, and are of African negro origin. They were rediscovered by Adam Renders in 1868. De Barros and Theodore Bent visited them. See Theodore Bent's *The Ruined Cities of Mashonaland* (3rd ed. 1895), and D. Randall-MacIver's *Medieval Rhodesia* (1906).

Zimisces. See BYZANTINE EMPIRE.

Zimme, Siam. See CHIENG-MAL.

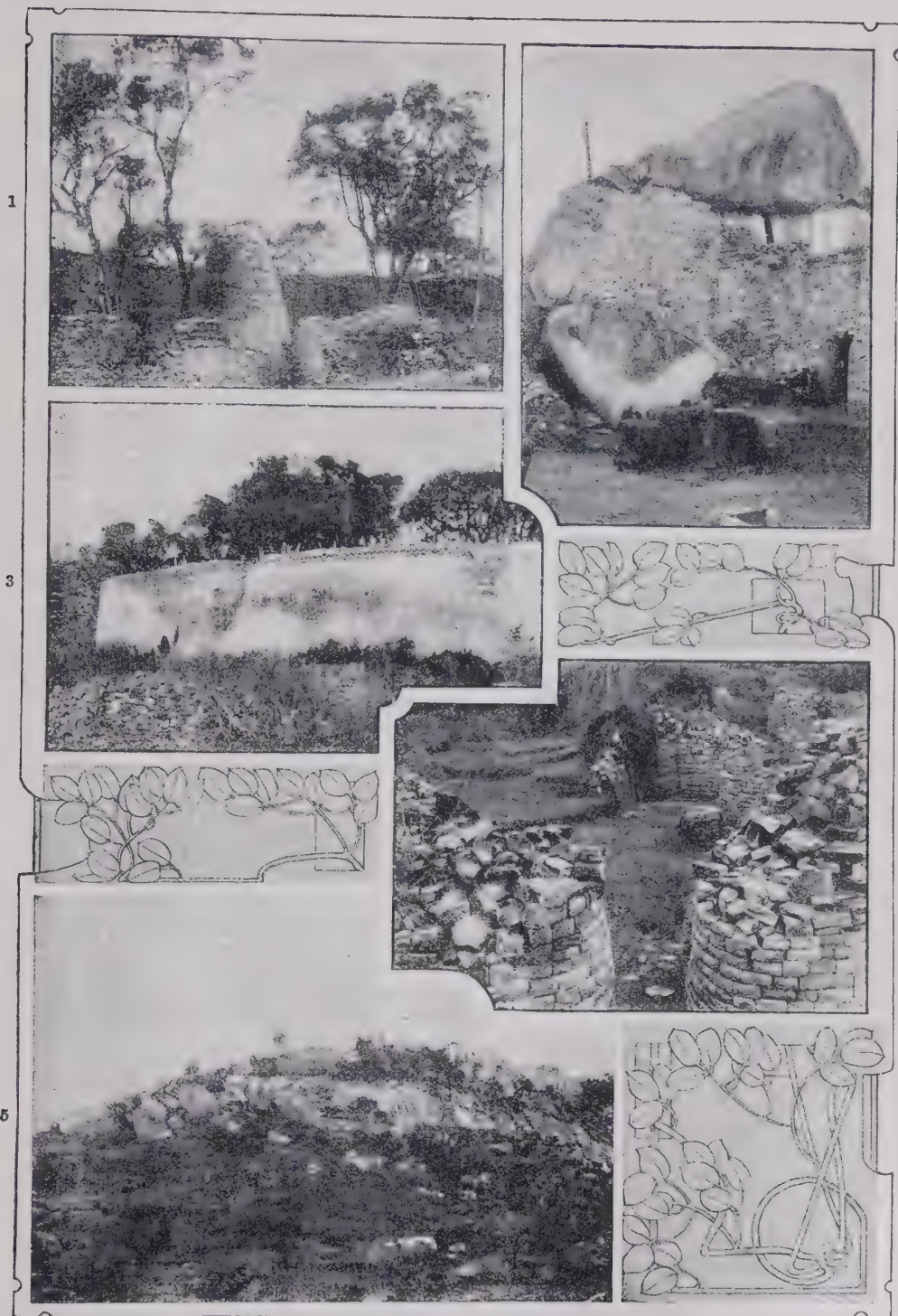
Zimmermann, ALBERT (1803-88), German painter, born at Zittau; is noted for his delineations of historical and mythological subjects, among his principal works, showing great breadth and dexterity in handling, being a *Combat of Centaurs*, *Mary Returning to the Cross*, and a *Flock Dispersed and the Shepherd Killed by a Mountain Hurricane*. He was professor of painting at Milan (1857) and at Vienna (1859-72).

Zimmermann, JOHANN GEORG, BARON VON (1728-95), Swiss physician and author, was born at Brugg, in canton Aargau. In 1768 he was appointed physician to the king of England at Hanover. In 1786 he attended Frederick the Great during his last illness. Later in life his state of mind was depressed almost to madness. His most famous book was *Ueber die Einsamkeit* (1755; better ed. 1784-5); he also wrote several books about Frederick the Great. See his own *Life*, in German, by Bodemann (1878).

Zimmermann, REINHARD SEBASTIAN (1815-93), German genre painter, born at Hagenau, on Lake Constance. He lived in Paris (1844-5) as a painter of portraits. Afterwards he visited England, and finally settled at Munich (1847). His principal works include the *Three Magi* (1850), *An Interrupted Game of Cards* (1869), and *Scene in a Village Inn* (1881). He wrote the autobiographical *Erinnerungen eines alten Malers* (1884).

Zimmern, HELEN (1846), philosophical and critical writer, born in Hamburg, but came to England when quite a child, and lived there as a naturalized British subject until 1887, when she settled in Italy. Her principal works are *Lessing* (1878); *Schopenhauer* (1876); a translation of Firdausi, issued as *Epic of the Kings*, and *Tales from the Edda*, both in 1882; *Life of Maria Edgeworth* (1883); *Hansa Towns* (1889); and *Sir Laurence Alma Tadema* (1902).

Zinc, Zn, 65.4, a metallic element that does not occur free in nature. Its chief sources are blende, ZnS, and calamine, ZnCO₃, but it also occurs in red zinc ore, ZnO, and hemimorphite or electric calamine, H₂Zn₂SiO₆. The ore is first roasted with access of air to convert it to oxide, which is then heated with small coal to set free the metal, ZnO + C = CO + Zn. The reduction is carried out in tubular retorts in the Belgian process, or in Δ shaped muffles in the Silesian method, both kinds being mounted in sets in a gas-fired furnace. The product is refined by melting in a reverberating furnace, the lead present settling below the zinc. Further purification is effected by redistillation. Zinc, also known as spelter, is a bluish-white crystalline metal, that is brittle at ordinary temperatures, but becomes malleable between 100° and 200° C. Its specific gravity is 7.1; it melts at 419° C., boils at 925° C., and is a fair conductor of electricity. Zinc, when rolled into sheets, is used for roofing, as it is but slowly affected by the weather, whilst it is also largely employed to alloy with other metals—e.g. with copper it forms brass. It is also much used for coating or 'galvanizing' iron to keep it from rusting, the iron being very thoroughly cleaned and immersed in a bath of molten zinc. When heated in air, zinc burns with a greenish flame, forming white woolly flakes of the oxide ZnO. This oxide is of basic character, and from it, as from the metal itself, the salts of zinc can be obtained by solution in acids. Thus zinc sulphate, or white vitriol, is obtained when the oxide or metal is dissolved in dilute sulphuric acid. The process is commonly employed in the latter case to prepare hydrogen, Zn + H₂SO₄ = ZnSO₄ + H₂. Zinc sulphate is prepared also by roasting sulphide ores, and crystallizes from water in colourless rhombic prisms of the formula ZnSO₄·7H₂O. It has a metallic taste, and acts as an astringent, being used on this account in the treatment of sores and ulcers. Internally it acts as a rapid

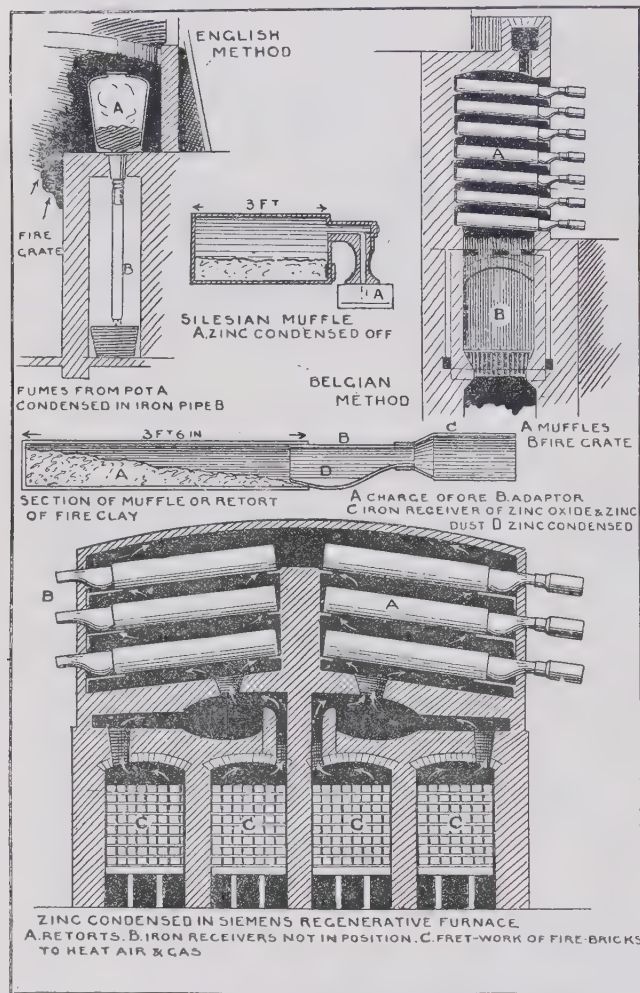


Ruins at Zimbabwe.

1. Interior of the Elliptical Temple: the Conical Tower. 2. Part of the Western Temple: Acropolis. 3. Façade of the Elliptical Temple.
4. The Philips ruins in the Valley. 5. General view of the Acropolis. (Photos by permission, from D. Randall-MacIver's *Medieval Rhodesia*.)

emetic, and is thus employed in cases of poisoning. Zinc chloride is obtained by dissolving the oxide, metal, or carbonate, in hydrochloric acid, the solution on evaporation yielding a white soft deliquescent mass, with caustic properties, and acting as an irri-

Zingiber, a genus of tropical herbaceous plants belonging to the order Scitaminaceæ. They bear spike-like thyrses of flowers, and several species are grown as stove or greenhouse plants. The rhizomes of *Z. officinalis* constitute the ginger of commerce.



Zinc Manufacture.

tant poison. It is employed in the solid form as a caustic, and in solution, under the name of Burnett's disinfecting fluid, as an antiseptic; it is also used as a flux in soldering, and for weighting cotton goods.

Zincography. See PROCESS WORK.

Zingel (*Aspro zingel*), a small perch found in the Danube.

Zinnia, a genus of half-hardy Mexican plants belonging to the order Compositæ. They bear heterogamous, radiate flower-heads, often brilliantly coloured, the ray florets being ligulate, and the disc florets tubular. The annual species are much grown in English gardens. Seed is sown over heat in April, and the young plants, having first been planted

out in a frame, are planted out of doors about the second week in June. Most of the garden zinnias are varieties of *Z. elegans*.

Zinzendorf and Pottendorf, NICOLAUS LUDWIG, COUNT VON (1700-60), restorer of the church of the Moravian Brethren, was born at Dresden. In 1722 he founded the Moravian colony of Herrnhut in Saxony. Exiled by the government of Saxony (1736), he travelled in Europe and America on behalf of his church, making many converts, till (1742) Frederick II. granted the Moravians full religious liberty. See *Lives* by Varnhagen von Ense (1860) and Spangenberg (1772-75).

Zion. See JERUSALEM, and JEWS, HISTORY OF.

Zionist Movement. See JEWS, HISTORY OF.

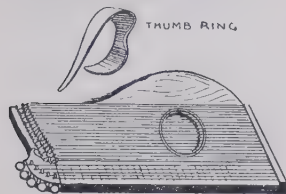
Zipaquira, tn., state of Cundinamarca, Colombia, 40 m. N. of Bogota, with salt, iron, and coal mines. Pop. 12,000.

Zircon, a mineral consisting of silicate of zirconium. It has a hardness of 7½, a specific gravity of 4.7, and forms semitranslucent, tetragonal crystals of varying colour. It is found in Ceylon, Norway, and the Urals. The colourless or finely coloured crystals are used as gems, the red under the name of jacinth, and the greenish as jargon, whilst opaque varieties form the source of zirconium.

Zirconium (Zr, 90.6), a rare element, occurring in Ceylon and other places as a silicate, Zr SiO₄, in zircon or hyacinth. It is prepared by displacement by aluminium or sodium from its fluorine-potassium compound, and forms silvery gray scales or a black amorphous powder. The zirconium salts are derived from the feebly basic zirconium hydroxide Zr(OH)₄. Zirconium oxide has been used as a component of incandescent gas mantles, and as a substitute for lime in the lime-light, whilst the coloured varieties of the naturally occurring silicate are used as gems.

Ziska, or ZIZKA VON TROCNOW, JOHANN (1360-1424), Bohemian religious leader; saw military service against the Turks, and fought at Agincourt (1415) on the side of the English. In July 1419 he headed a popular movement in Prague against the Roman Catholics. After that he formed an army of extremists from amongst the Protestant Hussites, and in October 1419 seized a hill overlooking Prague; but it was not till 1420 that the city revolted from the emperor Sigismund. The fortification of Mount Tabor in Bohemia gave Ziska a stronghold for the revolution, and in 1421 Sigismund was driven from Bohemia. A

German army that came against the Hussites was put to flight from Saaz, and in 1422 Sigismund was routed at Kuttenberg. In 1423 Ziska attacked the more moderate section (the Calixtines) of his own party, spreading fire and slaughter as far as Moravia and Hungary. See *Life* by Tomek (Ger. trans. 1882).



Zither.

Zither, a stringed instrument, which is thought to be of ancient Asiatic or Greek origin. It consists of a flat, shallow, oblong, wooden box, over the sounding-board of which the strings, resting on a bridge, are stretched. Concert instruments contain a fretted finger-board, and the melody strings over this are sounded by a metal plectrum on the right thumb of the player, the other strings being plucked by the fingers.

Zittau, tn., Bautzen dist. kingdom of Saxony, 25 m. by rail S.E. of Bautzen; has manufactures of damask and woollen goods. Lignite is mined. There is a fine town hall. Pop. (1900) 30,921.

Zittel, KARL ALFRED VON (1839-1904), German geologist, was born near Freiburg in Baden, and became an assistant at the Mineralogical Institute, Vienna. He was made professor of mineralogy at Karlsruhe (1863), and of geology at Munich (1866). In 1873-4 he took part in Rohlfs's expedition to the Libyan desert. He was also president of the Bavarian Academy of Science. His principal works are *Handbuch der Paläontologie* (1876-90); a treatise on geology and palaeontology, entitled *Aus der Urzeit* (1875); and *Beiträge zur Geologie und Paläontologie der Libyschen Wüste* (1883). See Rothpletz's *Gedächtnisrede auf K. A. von Zittel* (1905).

Zizel, or SUSLIK (*Spermophilus*), a genus allied to the squirrels, whose American representatives are called gophers.

Zizkow, tn., Austria, in Bohemia, an E. suburb of Prague. Pop. (1900) 60,089.

Zlatoust, tn., Ufa gov., E. Russia, 147 m. N.E. of Ufa city, with a cathedral and arsenal; also iron foundries and manufacture of weapons. Gold and iron are mined. Pop. (1897) 20,973.

Znaim, tn., Austria, in Moravia, 45 m. N.N.W. of Vienna. The site of the former castle of the margraves of Moravia is now occupied by a brewery. Vegetables are grown, especially pickling cucumbers. Pottery is the chief industry. Here was concluded the armistice of 1809 between Austria and France, which led a few days later to the peace of Vienna. Pop. (1900) 16,261.

Zoan. See TANIS.

Zodiac. (1.) The Bela of Gen. 14:2, 8, one of the 'five cities of the plain' (Gen. 19), at the base of the hills of Moab, in the plain of Shittim, Palestine, is now represented by a ruined mound. (2.) Village, Tuscarawas co., Ohio, U.S.A., on the Tuscarawas, 100 m. by rail S. of Cleveland; was till 1898 the seat of a German communistic society (Separatists).

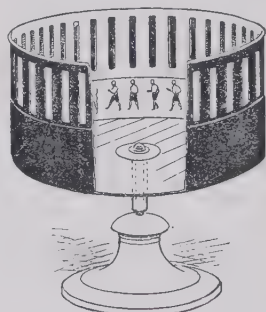
Zodiac, a belt of the sky extending 8° on each side of the ecliptic, and comprising the apparent paths of the sun, moon, and principal planets. It is divided into twelve signs of 30° each, the names and symbols of which are—Aries, ♈; Taurus, ♉; Gemini, ♊; Cancer, ♋; Leo, ♌; Virgo, ♍; Libra, ♎; Scorpio, ♏; Sagittarius, ♐; Capricornus, ♑; Aquarius, ♒; Pisces, ♓. The first six are north of the equator, the last six south of it. The six 'ascending' signs are those from Capricornus to Gemini inclusive, in which the sun is moving northward; the six 'descending' signs, those in traversing which he continually increases his north polar distance. The series begins with the vernal equinox, and shifts through precession. The zodiac is of immemorial antiquity. It was invented in Babylonia, essentially as we know it, not later, and probably much earlier, than 2000 B.C. The Greeks adopted it about the 6th century B.C., and transmitted it westward. The Chinese Kung, which can be traced back to the 7th century B.C., included the twelve signs—Tiger, Hare, Dragon, Serpent, Horse, Ram, Ape, Cock, Dog, Boar, Rat, and Ox. They were superseded, three centuries ago, under the tutelage of Jesuit missionaries, by the European zodiac. The Mexican zodiac was divided into twenty signs. Our zodiacal symbols came into use about the 10th century A.D. The lunar zodiac, widely diffused throughout the East, included twenty-seven or twenty-eight sections, representing the moon's daily motion. In India they were intimately connected with the Vedic ritual.

Zodiacal Light, so called from its situation in the zodiac. It is a cone of faint luminosity, visible after sunset near the

vernal equinox, and before sunrise, six months later, extending from the place of the sun over an arc of about 80°. Brightest at the horizon, it is there from 20° to 30° broad, and tapers upward to a blunt apex. It appears to be a solar appendage of a lenticular shape, occupying sensibly the same level—if Dr. Wolf's photographic indications be reliable—with the solar equator (*Sitzungsberichte*, Munich, xxx., 197), and reaching out beyond the earth's orbit. It is generally thought to be composed of cosmic particles revolving independently round the sun, and reflecting his light. An alternative view is, that the 'false dawn' (as it was called in Persia) represents an extension of the coronal equatorial electric streamers. It has been successfully photographed by Mr. A. E. Douglass at the Lowell Observatory in Arizona. The related phenomena of the 'zodiacal band' and the *Gegenschein* remain enigmatical. The former is a narrow ribbon of dim light connecting the opposite summits of the cone, so as to complete the circuit of the zodiac. The *Gegenschein*, noticed by Pezénas in 1730, but effectively observed by Brorsen in the middle of the 19th century, is a diffuse, roundish glow, situated diametrically opposite to the sun. Gyllén and F. R. Moulton (*Celestial Dynamics*, p. 209) sought to explain it as possibly an assemblage of oscillating satellites.

Zoc (c. 978-1050), Byzantine empress, was the daughter of Constantine VIII. She was accessory to the murder of her first husband, the emperor Romanus (1034), after which she married and raised to the throne Michael IV. After his death (1041), she married (1042) Constantine IX.

Zoca. See CRAB.



Zoetrope.

(Part removed to show picture.)

Zoetrope, or THAUMATROPE, a scientific toy, in which, by the combination of a series of pictures, each representing the same

figure but in a different position, a continuous and moving representation of the figure is given. It consists of a cylinder, closed at one end, and inside of it a strip containing the pictures is wound. The cylinder is rapidly revolved, and on looking through slits placed at the top, and equal in number to the number of pictures, the necessary optical illusion is produced.

Zoffany, JOHANN (1735-1810), German painter, was born at Ratisbon; spent several years in Rome from 1748, and came to England (1758). He painted Garrick in many of his famous impersonations, and portraits of a large number of royalties and noble personages.

Zohar, or **SOHAR**. See **CABBALA**.

Zola, EMILE EDOUARD CHARLES ANTOINE (1840-1902), French novelist, born in Paris. He began early to write, his first book being *Contes à Ninon* (1864), which had some measure of success, as also had his critical papers on literature and art in *L'Événement*, edited by Villemessant. The powerful but repulsive novel, *Thérèse Raquin*, which appeared in 1867, strengthened his reputation, as did the *Chronicles of the Rougon-Macquart Family*—the first series commencing with *La Fortune des Rougon* (1871), and concluding with *Son Excellence Eugène Rougon* (1875), the intermediate works of the series being *La Curée* (1872), *Le Ventre de Paris* (1872), *La Conquête de Plasans* (1873), and *La Faute de l'Abbé Mouret* (1874). This first series was entirely eclipsed by the enormous popularity which attended his next novels. In 1877 *L'Assommoir* appeared—a novel depicting, in realistic but lurid colours, the awful consequences of the craving for drink. Then came *Nana* (1880), and then a second series of the *Rougon-Macquart Chronicles*, up to *Le Docteur Pascal* (1893). These fictional annals rival Balzac's *Comédie Humaine* in patient analysis of character and vivid interest. If Balzac were the greater psychological analyst, Zola was the more powerful novelist. Zola also attacked the problem of miracle-working in *Lourdes*, of the Romish Church as a means of popular reformation in *Rome*, of the inner life of the masses in *Paris*, of population in *Fécondité*, of labour and its agencies in *Travail*. He was also the author of several plays and of numerous volumes of essays. He also took a very prominent part in the rehabilitation of Captain Dreyfus. Having convinced himself that the captain was innocent, he attacked the army and all those opposed to Dreyfus in a denunciatory letter in the *Aurore* (1898), in which

he openly challenged legal consequences. These ensued, and though Zola ultimately won, he found it prudent to seek temporary refuge in London. Zola was found dead in his bedroom in Paris, having been asphyxiated by the fumes of a charcoal stove. Zola was more than once a candidate for a seat in the French Academy, but was never successful.



Emile Zola.

(Photo by Russell & Sons.)

Zolliker, GEORG JOACHIM (1730-88), Swiss Protestant preacher, born at St. Gall; was a clergyman at Murten in Vaud; became pastor of the Calvinistic community at Leipzig (1752), and was the foremost preacher of his age. His *Sermons Complets* was published in 1789-1804. See Garve's *Ueber den Character Zöllikers* (1788).

Zöllner, JOHANN KARL FRIEDRICH (1834-82), German astronomer, born at Berlin, and appointed professor of astronomy at Leipzig (1866). His principal writings include *Ueber die Natur der Kometen* (1871), *Grundzüge der Allgemeinen Photometrie des Himmels* (1861), and *Photometrische Untersuchungen* (1865). He gave considerable attention to spectrum analysis, observation of the sun, and spiritualism.

Zollverein, a German word meaning customs union. It first came into use as the name for the commercial arrangements set up (1833) between Prussia, Hesse-Kassel, Hesse-Darmstadt, Bavaria, and Württemberg, in virtue of which these states (1) adopted a common tariff, and (2) abandoned all duties which had hitherto been levied on goods imported from the other contracting states. This was followed by several

arrangements between the various states of Germany, all intended to further the same end, which was at length effectively attained by the union of the German empire in 1871. Similar commercial arrangements have been made between large and small states—e.g. San Marino and Italy (1862), Monaco and France (1865), Portuguese India and British India (1878). Since the Boer war of 1899-1902 a South African customs union has been formed.

Zolyom-Brezo, or **BREZOVA**, vil., Hungary, prov. Neutra, 140 m. E.S.E. of Brünn. Pop. 6,000.

Zomba, tn., cap. of British Central Africa protectorate, 10 m. west of Lake Shirwa.

Zombor, royal free city, cap. of co. Bacs-Bodrog, Hungary, 60 m. S.W. of Szegedin; manufactures flour, and trades in grain and cattle. Pop. (1900) 29,609.

Zone, in astronomy, a section of the sphere intercepted between two parallels of declination. Star catalogues on an extensive scale are frequently constructed in zones. Bessel's zones extended from dec. -15° to +45°, and embraced 64,000 stars; Argelander's reached from -31° to +80°, and yielded 40,000 stars; Gould observed 73,160 stars in zones between -23° and -80°. The *Cape Photographic Durchmusterung* is arranged in zones 1° wide; and the same plan has been adopted for the international astrographic catalogue now in course of publication, as well as in the corresponding chart of the heavens.

Zooantharia, the name of the order which includes the sea-anemones and their allies.

Zoö-Geography. See GEOGRAPHICAL DISTRIBUTION.

Zoogloea. See BACTERIOLOGY. **Zoid**, a term applied to the products of vegetative multiplication—for example, in the Hydrozoa, where each polype in a sea-fir colony is a zoid. Zoid is also sometimes applied to the units in a Polyzoon colony.

Zoological Society, of London, was founded in 1826 and incorporated in 1829. It has its headquarters in Hanover Square, and meets regularly between November and June, for the reading of papers on zoological topics. The *Proceedings* of the society are published four times a year. The society's collections of living animals is lodged in the Zoological Gardens (the 'Zoo') in Regent's Park. The gardens were started in 1828, and cover 30½ acres; they are open to the public on week days throughout the year, but on Sundays are reserved for fellows and their friends. See H. Scherren's *The Zoological Society of London* (1905), and the society's *Annual Report*.

Zoology is the scientific study of animal life as distinguished from biology, which covers the study of plant life as well. See BIOLOGY, and the articles on the several species of animals.

Zoophyte, a name sometimes given to certain of the Coelentera, notably to the sea-firs and their allies, from the apparent resemblance to a plant.

Zoospore, a mobile spore or swarm spore, produced by many algae and fungi. See SPORE.

Zöpfiel, RICHARD OTTO (1843-91), German theologian, born at Arensburg in Livonia; was first a teacher of theology at Göttingen, but afterwards removed (1872) to Strassburg, where he was appointed professor of theology (1877). He wrote two excellent works, *Die Papstwahlen* (1871), and *Johannes Sturm* (1887), and collaborated with H. J. Holtzmann in an edition of the popular *Lexikon für Theologie und Kirchengewesen* (3rd ed. 1895).

Zorndorf, vil., Brandenburg prov., Prussia, 5 m. N.N.E. of Küstrin, was the scene of the defeat of the Russians by Frederick the Great on Aug. 25, 1758.

Zoroaster, or ZARATHUSHTRA, founder of the religion of the Parsees and of ancient Persia, was of princely descent, but little that is authentic is known of his life. He is supposed to have commenced his ministry at the age of thirty, and preached a pure monotheism and an ideal morality. His teaching was pre-eminently one of persuasion; and apparently he made no effort to obtain proselytes, or in any way to interfere with those of other creeds. Zoroaster is supposed to have been murdered, in his 75th year, at Bactria. See further under ZOROASTRIANISM.

Zoroastrianism, the religion of the ancient Persians, preached by Zoroaster, was established at least 800 years B.C. It was a protest against polytheism, idolatry, and the licentiousness of the age. Its monotheism is thus expressed: 'There is only one God, and no other is to be compared to Him;' a Creator without form, invisible, mighty, just, merciful, and worthy of adoration—the Elohim or Jehovah of the Old Testament. The teaching of the creed is conveyed in the simple declaration, 'Perform good actions, and refrain from evil ones.' Zoroaster recognized, as all revivalists have done, the existence of two powerful agencies—the creative and the destructive, the good and the evil; the soul in conflict with the body, the spirit warring against the flesh. Fire and light were taken to represent the beneficent agent, charred wood and darkness the evil. He made no attempt, how-

ever, to reconcile man's liberty with God's providence, man's suffering with God's rectitude; but declared that everything was for the best for every individual. The Bible of the faith is *Zend-Avesta*; but a more modern and more popular code of morals is contained in the *Revelations of Arda Viraf*. The descriptions of heaven and of hell contained in this book may aptly be compared to the visions of Isaiah and St. John, and to the *Inferno* of Dante. The strongly-marked characteristics of the faith are hospitality, philanthropy, and benevolence. Zoroastrianism has no active missionary agency; its founder seems to have been concerned with the reclamation of his countrymen, and to have treated other forms of faith with a large-hearted tolerance. This creed was professed by the ancient Persians from the end of the 6th century B.C., but lost influence after the downfall of the Achæmenian dynasty in 331 B.C. It was again made supreme by the Sasanian dynasty (227-636 A.D.), until supplanted by Mohammedanism. The modern adherents are the Parsees. See Windischmann's *Zoroastrische Studien* (1863), Tiele's *Geschichte der Religion im Altertum* (1898), Jackson's *Zoroaster, the Prophet of Ancient Iran* (1899), and books quoted at ZEND-AVESTA.

Zorrilla y Moral, JOSE (1817-93), Spanish poet and dramatist, a wayward genius, whom political persecution kept poor and in frequent exile. Though his work is often hasty and loose, his patriotic choice of themes and his real gifts have kept him from oblivion. His narrative-historical poems, *Leyenda de Alhama* and *Leyenda del Cid*, are less popular than they were; but his dramas keep firm hold on Spain by their strength and fervour, especially *Don Juan Tenorio* and *El Zapatero y el Rey*. His *Don Juan* has been represented more than once on the English stage. See Zorrilla's autobiography, *Recuerdos del Tiempo Viejo* (1894).

Zorzi, BERTOLOME (c. 1230-c. 1290), Italian poet who wrote in Provencal. He was imprisoned by the Genoese from 1265 to 1273, during the war between Venice and Genoa. While in captivity he wrote several interesting *serventes*—one in defence of Venice (in answer to Calvo), another on the death of Conradin (1268), and a third in support of the crusade of 1270. These, together with some moral and love poems, were edited by E. Levy in a masterly monograph (1883).

Zosimus (fl. 425 A.D.), Greek historian. His history traces the decline of the Roman power from the establishment of the empire

by Augustus to 410 A.D. It is mainly an abridgment of previous works; but the paganism of the author leads him to attack the Christian emperors. Edition by Mendelssohn (1887).

Zouaves, originally Kabyle soldiers of the French army, recruited (1830) in Algeria at the time of the taking of Algiers. At first French and Kabyle soldiers were enrolled in the same regiments and the same company; afterwards in the same regiment, but in different companies; and from 1840 the Zouaves were entirely Frenchmen, who wore a semi-Moorish uniform. The Kabyles fought in the Franco-German war of 1870 as Turcos.

Zoutpansberg, mt. range, a detached portion of the Drakenberg, S. Africa, stretches E. and W. south of the Limpopo R., in Transvaal Colony. The great salt pan at its W. extremity gives name to the mountains and to the mining district.

Zrinyi, NIKLAS, COUNT VON (1508-66), Hungarian general, who distinguished himself in the wars with the Turks. He ably defended Croatia, of which he was ban (governor), from 1542, and his exploits have been made the subject of drama. In 1566, with 3,000 troops, he held the town of Sziget against Solymán the Magnificent, who besieged it with more than 50,000 men, and fell fighting to the last.

Zschokke, JOHANN HEINRICH DANIEL (1771-1848), German man of letters, was born at Magdeburg. He had a chequered early life, and was for a while a strolling player. Then he lectured at Frankfurt, and wrote for the theatres. After 1800 he filled various public offices in the republic and in the canton of Aargau. In 1798 he wrote his *Geschichte des Freistaats der drei Bünde in Rhätien*, and concerned himself with Swiss politics. Amongst his works are histories—Switzerland (1822) and Bavaria (1813-18)—and many tales, collected as *Bilder aus der Schweiz* (1824-5), *Ausgewählte Novellen und Dichtungen* (ed. 1874), and *Ahrenlese* (1844-7). But his most popular book was the religious *Stunden der Andacht* (1809-16). See his autobiographical *Selbstschau* (1842), and *Life*, in German, by Born (1885).

Zuccaro, FEDERIGO (1543-1609), Italian painter, was born in Tuscany; was assistant of his brother Taddeo (1529-66), who was engaged at the Vatican. Then he was employed in decorative painting at Florence and Venice, and was called to Rome in 1566 to complete Taddeo's work in the Vatican. On account of a quarrel he fled to France, and in 1574 came to England. There he

painted a number of portraits, including Queen Elizabeth's and Leicester's, but after a six years' stay returned to Italy. After a visit to Spain, where he painted frescoes for the Escorial, he founded at Rome the Academy of St. Luke.

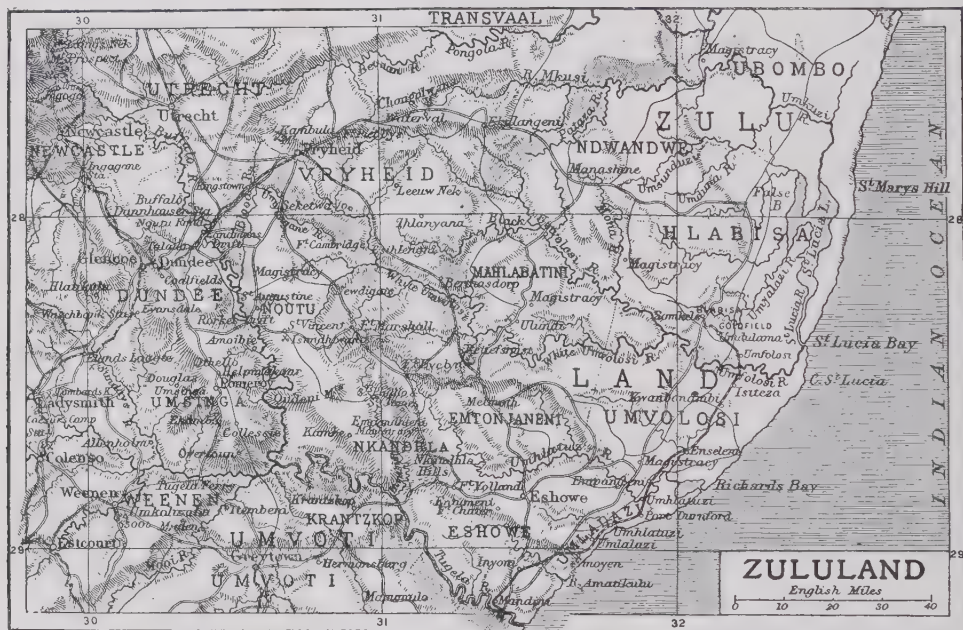
Zug. (1.) Swiss canton, the smallest in area (92 sq. m.), and the smallest but one in population, mainly German-speaking and Roman Catholics. It became a canton in 1352. Pop. (1900) 25,203. (2.) Town, cap. of the above canton, is a quaint little town at the N.E. corner of the Lake of Zug (15 sq. m. in area, 9 m. long), 14 m. S. of Zürich. Pop. (1900) 6,593.

the most disastrous taking place in the 13th century. Reclamation schemes have been discussed by the Dutch government, and in 1900 a bill was introduced, but afterwards withdrawn, to reclaim, first some 115,000 acres of the southern part, at a cost of £7,917,000, and eventually 500,000 acres, at an estimated additional cost of £24,000,000.

Zukertort, JOHANN HERMANN (1842-88), chess master, was born in the province of Riga, and served with the medical corps in the Austro-Prussian and Franco-German wars; and after the close of the latter took up the career of chess master, having been a pupil of Anderssen, whom in 1871 he

and has a population (1900) of 185,000, the white population numbering about 1,300. St. Lucia Lagoon and Bay give it communication with the sea. Its coast lands are unhealthy, but the interior affords some of the finest pasture land in S. Africa.

Zulus, or AMA-ZULUS, a Bantu people of S.E. Africa, whose original domain lay between the Tugela R. and Lake St. Lucia, but early in the 19th century was extended by conquest over Natal, the late Boer states, Southern Rhodesia, and Gazaland, and at some points even beyond the Zambezi to Nyasaland and Lake Tanganyika. With the kindred Ama-Xosas, commonly called



Zuider Zee ('Southern Sea'), a gulf of the Netherlands, separated from the North Sea by the chain of islands, Texel, Vlieland, Terschelling, Ameland, and Schiermonnikoog, and communicating with it by the Marsdiep, the Blijerland Gat, and the Vlie Strom, is 85 m. from N. to S., and 45 m. in greatest breadth, and covers an area of 2,027 sq. m. It is very shallow, the average depth being from 10 ft. to 19 ft.; but the action of the wind makes it necessary to protect the shores, particularly in the S., by dikes. Formerly a lake (Flevo), surrounded by fens and marshes, the Zuider Zee acquired its present dimensions through inundations in the 12th to the 15th century—

defeated. He came to England, and was naturalized in 1872. He beat Blackburne (1881), Rosenthal (1880), and achieved his ambition of beating Steinitz in 1883, at the great London tournament of that year. Steinitz defeated him, however, in America, in 1885. Play exhausted his nervous energy, and eventually he broke down under the strain.

Zululand, a territory in N.E. of Natal, British S. Africa, separated from it by the Tugela R., after being administered as a protectorate (along with Amatongaland) from 1887, was in December 1897 incorporated with Natal. Including Amatongaland and the Ingwavuma district, it covers an area of 10,461 sq. m.,

Kaffirs, they form the Zulu-Kaffir division of the southern Bantu family. Zulus, Xosas, Galekas, Gaikas, Tembos, and all the other Kaffirs, are essentially one people, with common physical and mental characters, speech, religion, usages, and traditions. The Zulus are so named from a legendary chief Zulu, ancestor of Dingiswayo, founder of the Zulu state, about the close of the 18th century. The ruthless military system introduced by him was further developed by his successor, Chaka, during whose reign (1800-28) the Zulu power was firmly established, and the Zulu name became a terror to all the surrounding peoples. The system was first shaken by collision

with the Boer pioneers in 1834-8, when Chaka's successor, Dingaan, was overthrown in Natal, and his great captain, Umzilikatsi, driven from Transvaal across the Limpopo to Matabililand. But it still persisted for several decades, till finally suppressed by the English, who in 1879 defeated and deposed Cetywayo, last of Dingiswayo's dynasty, and in 1893 overthrew Umzilikatsi's successor Lobengula. With the capture and deposition of the Zulu chief Gungunyana by the Portuguese in Gazaland (1896), the last remnant of the Zulu military power was extinguished. In 1906 there was a revival of Zulu unrest in Natal, which had to be put down by

Zumpt, AUGUST (1815-77), German philologist, was born at Königsberg, nephew of Karl Zumpt. He became (1851) a lecturer on Latin epigraphy at Berlin. His researches into Roman antiquities have been of much use to scholars. His principal works include *Monumentum Ancyranum* (1845; and supplement, 1869); *Commentationes Epigraphicae* (1850-4); and *Studia Romana* (1859).

Zumpt, KARL GOTTLÖB (1792-1849), German philologist, was born at Berlin. After teaching at the Joachimsthal academy (1821-26), he was appointed professor of Roman literature in the University of Berlin (1827). In

Caspian basin with the Mongolian lowlands. These are (1) the Irtysh and Urungu valleys; (2) the valleys of the Sassik-kul, Ala-kul, Ebi-nor, and other lakes forming the 'Zungarian strait'; (3) the valley of Chuguchak. Chinese Zungaria again has three principal physical regions—(1) the low-lying steppes and lakes, to W. and N.; (2) valleys and arable plateau land of medium elevation, mostly in the central region; (3) mountains to E. and S. The Mohammedan inhabitants are generally known as Dungans or Tungsans.

Zuñiga. See **ERCILLA Y ZUÑIGA**.

Zunz, LEOPOLD (1794-1886), Jewish scholar, born at Detmold



Zürich.

armed force. See Bishop Colenso's *Extracts from the Blue Books, etc.* (1880); Frances Colenso's *The Ruin of Zululand* (1884); R. N. Cust's *The Modern Languages of Africa* (1883); and A. H. Keane's *Africa*, vol. ii. (2nd ed. 1904).

Zumala-Carrégu, TOMAS (1789-1835), Spanish general in the cause of Don Carlos. He was born at Ormaiztegua, and fought under Mina against Napoleon's invasion of Spain, and under Quesada (1820). Having in 1832 been dismissed from the army as a Carlist, he in 1833 headed the Carlist insurrection. He gained some victories, but was mortally wounded at the siege of Bilbao.

1835 he was elected a member of the Royal Academy of Sciences of Berlin. His principal claim to notice is his *Latin Grammar* (Eng. trans. 1823), the chief feature of which is its syntax, a work remarkable for its thoroughness. See *Life*, in Latin, by A. W. Zumpt (1851).

Zungaria, a region of both the Chinese and Russian empires, between the Central Tian-Shan and the W. Altai; with an area of 148,000 sq. m., and a population of 600,000 (estimated). On the W. side, Chinese Zungaria is intersected by the Ek-tag Altai, Tarbagatai, and Ala-tau ranges, between which open three great depressions connecting the Aral-

in Germany, was (1839-50) principal of the Jewish college at Berlin. His principal works are *Die Gottesdienstlichen Vorträge der Juden* (1832); *Die Synagogale Poesie des Mittelalters* (1855); *Die Ritus des Synagogalen Gottesdienstes* (1859); and *Literaturgeschichte der Synagogalen Poesie* (1865).

Zurbaran, FRANCISCO (1598-1662), Spanish painter, born in Estremadura; was appointed court painter to Philip IV., and, from the similarity of his style to that of the Italian painter, he has been called the Spanish Caravaggio. His most famous work is an altar-piece, the subject being St. Thomas Aquinas, which he

executed for the church of the College of St. Thomas Aquinas at Seville.

Zürich. (1.) Swiss canton, ranks officially as the first in the confederation, which it entered in 1351 as its fifth member. Its area is 665 sq. m., and its population (inferior only to that of Bern) is (1900) 431,036, mainly German-speaking and very largely Protestant. It is the industrial and manufacturing region of Switzerland. (2.) The most populous and most important town in Switzerland, cap. of the above canton, is built on the Limmat as it issues from the Lake of Zürich (34 sq. m. in area, and 25 m. in length), and of recent years has vastly increased in size and splendour. It is the centre of the Swiss silk manufacture, while much cotton and machinery are also made. Zürich was the scene of the labours of Zwingli, the reformer. Pop. (1900) 150,726.

Zurita, JERONIMO (1512-80), Spanish historian, born at Saragossa. He was (1547) the official historiographer of Aragon, and one of the first of the modern historians of Spain, seeking his material from official sources and confining himself to a narrative of a limited and recent period. His principal work is *Anales de la Corona de Aragon* (6 vols. 1532-79), ending with the death of Ferdinand the Catholic. He also wrote a corrected edition of the *Chronicles of Castile* of Pedro Lopez de Ayala.

Zutphen, tn., Netherlands, prov. Gelderland, 17 m. N.E. of Arnhem, on the IJssel. It has a very interesting church and houses of 16th and 17th centuries. Under its walls Sir Philip Sidney was killed in 1586. Pop. (1900) 18,381.

Zuyder Zee. See ZUIDER ZEE.

Zvenigorodka, tn., Kiev gov., S.W. Russia, 91 m. S.S.E. of Kiev; manufactures tobacco and candles. Pop. (1897) 16,972.

Zweibrücken (Fr. *Deux-Ponts*; Lat. *Bipontinum*), tn., 43 m. N.W. of Strassburg; was the cap. of a duchy of same name, now included in the Rhine Palatinate, Bavaria. Machinery, leather, and cotton goods are manufactured. Pop. (1900) 13,716.

Zwickau, tn., kingdom of Saxony, prov. Zwickau, picturesquely situated on l. bk. of the Mulde, 20 m. W.S.W. of Chemnitz. Chemicals, glass, earthenware, and machinery are manufactured. Coal

is mined. The church of St. Mary dates from 1451. Schumann, the musical composer, was born here. Pop. (1900) 55,830.

Zwingli, HULDREICH, or ULRICH (1484-1531), Swiss reformer, born at Wildhaus, in the canton of St. Gall, and studied at the University of Vienna, under the humanist Conrad Celtes. In 1502 he went to Basel, where he taught for a time. In 1506 he was called to be pastor of Glarus, and more than once accompanied his parishioners to the wars in Italy as their chaplain. Meantime his studies (in Greek and Hebrew) of the Holy Scriptures, and the influence of Wyttenbach, led him to serious doubts regarding certain doctrines of the church; and these were confirmed by a study of the fathers, and by the influence of Erasmus. During his stay of ten years at Glarus, he made two discoveries which materially affected his future career—one that it had been the custom in the early Swiss Church that immediately after baptism the sacrament of the eucharist should be administered to the child, and that the various mass books did not agree. This, to his mind, was sufficient to disprove the claim of the Church of Rome that her liturgy had been the same in all ages. From Glarus he went to Einsiedeln, then as now the most famous place of pilgrimage in Switzerland and Southern Germany. There Zwingli preached more freely than he had been able to do at Glarus, declaring that the Scriptures were the only safe rule in matters of faith. At the same time he publicly denied the right of the pope to decide in religious questions, and offered a bitter opposition to the sale of indulgences. In December 1519 he was appointed pastor of the cathedral church of Zürich, and there he laboured for the remainder of his life, his influence being powerfully exerted upon the side of the reformed doctrines. In January 1523, at a great council held in the town hall at Zürich, the city council gave an emphatic and official approval of Zwingli's doctrines, and requested all preachers in the canton to present them. In 1531 war was declared by the five papal cantons—Lucerne, Zug, Schwyz, Uri, and Unterwalden—instigated by Rome against the two reformed cantons, Zürich and Bern. The latter were totally defeated, many

of them being slain; among the latter was Zwingli. Luther and Zwingli differed widely on the subject of the character of the Lord's Supper; but modern theology has pronounced in favour of the Zwinglian view, rather than Luther's. The contention between the two reformers produced a division in Protestantism, splitting the continental supporters of the reformation into Lutherans and the Reformed Church. See *Lives* by Myconius (1532), Schuler (1819), Hottinger (1841), Hoff (1882); and, in English, by Macauley Jackson (1901) and Simpson (1903). Zwingli's *Works* were published in 4 vols. (1545), also in 8 vols. (1828-42). A volume of *Selections* was issued by Macauley Jackson (1904).

Zwittau, tn., Moravia, Austria, near Bohemian frontier, 40 m. by rail N. of Brunn; has manufactures of cotton and linen. Pop. (1900) 9,029.

Zwolle, tn., Netherlands, cap. of prov. Overijssel, near r. bk. of IJssel, 38 m. N.E. of Utrecht. It possesses buildings of from 15th to 17th centuries. Thomas à Kempis, author of *De Imitatione Christi*, spent here the last sixty-four years of his life (1407-71). Pop. (1900) 30,560.

Zygophyllaceæ, a natural order of trees, shrubs, and herbaceous plants of wide distribution in the warmer extra-tropical parts of the world. Among the genera are *Zygophyllum* and *Guaiaacum*.

Zygophyllum, a genus of shrubs and herbaceous plants belonging to the order Zygophyllaceæ. They bear yellow, red, or white flowers, followed by capsular fruit. A few species are grown in greenhouses, a peaty loam being the desirable compost. Among the best is *Z. Fabago*, the Syrian bean-caper, with copper-coloured flowers in autumn.

Zygostates, a genus of Brazilian, epiphytal orchids, bearing racemes of small flowers, and thick, fleshy leaves. *Z. greeniana*, which bears white flowers, with green-striped lips, is sometimes cultivated as a stove plant.

Zymotic, a term, introduced in 1842 by Dr. Farr, to denote the poison and pathological processes of epidemic, endemic, and contagious diseases. The use of the word is now most commonly restricted to the acute specific fevers, such as scarlatina and smallpox.

9

APPENDIX OF PRONUNCIATION TO THE HARMSWORTH ENCYCLOPÆDIA.

Note.—All unmarked vowels are to be taken as short, as in fat, met, fit, not, but.

All long vowels and diphthongs, except the conventional oo, where no mark is needed, are *marked*, as follows:—

- ā = a in fate.
- ä = a in far.
- a = a in fall, or a in awe.
- ē = e in me.
- ī = i in mine, or ai in aisle.
- ō = o in mote.
- oo = oo in moon, or u in put.
- ū = u in mute, or ew in few; also French u.
- ε = French eu, German ö, or Turkish eu and oi.

Consonants are normally as in English. Special points are:—

- c discarded, being = either to s in sit or k in cat.
- ch as ch in chin.
- ch = German ch in ich and Keltic ch in loch.
- dh = th in then.
- g = g in give, go: always hard.
- ng = ng in singer.
- ng = ng in finger.
- j = j in joy.
- q discarded, being with u, which always follows it = kw.

th = th in thin.

w = w in wet: is never a vowel.

x discarded, being = ks or gs.

y = y in you: is never a vowel.

z = z in zeal.

zh = z in treasure.

Special Values (mostly makeshifts).

' = Semitic ain (Arabic and Hebrew), as in *abd*, slave.

ˆ = e mute (Hebrew and French), as in *yab'däl*, *d'la* (de la).

' separates the aspirate in the aspirated letters of Hindi, Urdu, and the other neo-Sanskritic languages. Thus—*b'haḡ*, *p'hal*, *t'hop*, *g'har*, *ch'har*, etc.

gh = ghain (Arabic), as in *gharb*, the west.

n̄ = nasal n (French, Portuguese, Arabic, etc.), as in *mon*, *nação*, *fauran*, etc.

ly = palatal l in William; French ll in *voilaille*; Italian gl in *egli*.

ny = French and Italian gn in *seigneur*, *signore*; Spanish ñ and Portuguese nh, as in *señor*, *senhor*.

h̄ = strong Semitic (Hebrew and Arabic) h, as in *bahr*, sea, river.

' = stress, as in *pres'ent*, *pre-sen't*.

For full discussion of the Pronunciation Scheme see Introduction to Appendix (Vol. I.).

VOLUME VIII.—Sol-fa to Zymotic.

Solfatara, sol-fa-tä'ra.
Solfeggio, sol-fej'ji-o.
Solidago, sol-i-dä'gō.
Soligalich, sol-ig-al-ich'.
Solingen, söl'ing-en.
Solitaire, sol-it-är'.
Solmona, sol-mō'na.
Solofra, sol-lof'ra.
Solonovka, söl-on-ov'ka.
Solovetski, söl-ov-et'ski.
Solyman, sol-i-män'.
Somali, sō-mä'li.
Sombrerete, som-brä-rä'tä.
Sombrero, som-brä'ro.
Somnath, som-nät'h.
Sonata, sō-nä'ta.
Sonchus, son'kus.
Sonderborg, son'der-bor.
Sonderbund, son'der-boond.

Sondershausen, son'derz-houz-en.
Sondrio, son'dri-o.
Song-chin, song-chin'.
Song-dō, song-dō'.
Songhay, son-ghi'.
Song-kol, song-koi'.
Sonmiäni, son-mi-ä'ni.
Sonnenschein, zon'en-shin.
Sonnino, son-nē'no.
Sonpat, son'put.
Sontag, zon'tak.
Sontal, son'ti.
Sophocles, sō'fō-kläs or sof-ok-lēz.
Sorau, zō'rou.
Sorbonne, sor-bon'.
Sordello, sor-del'lo.
Sordes, sor'dēz.

Sorel, sor-el'.
Soresina, sō-res-ēn'a.
Soria, sō're-a.
Sorö, sor'e.
Soroeki, sō-rō'ke.
Soron, sō-ron'.
Sorrento, sor-ren'to.
Sortes Virgilianæ, sor'tes vir-gil-i-ä'nē.
Soteriology, so-tēr-i-ol'o-gi.
Sotteville-lès-Rouen, sot-vil-lä-roo-an'.
Soubise, soo-bēz'.
Soul (Seoul), sool (sä'ool).
Soulay, soo-lä-rē'.
Soult, soolt.
Souza, soo'za.
Soyer, swä-yä'.
Spa, spä.

Spahi, spä'hē.
Spalato, spä'la-to or (wrongly) spal-a'to.
Spallanzani, spal-lan-tsä'ni.
Spandau, span'dou.
Spanheim, span'him.
Sparaxis, spar-ak'sis.
Sparta, spar'ta.
Spartacus, spar'ta-kooos or spar'ta-kus.
Spartan, spar'tan.
Spartanburg, spar'tan-burg.
Spartiate, spar-ti-ät' or spar'ti-ät.
Spatha, späth.
Spectro-heliograph, spek-tro-hel'i-o-graf.

Appendix of Pronunciation.

- Spectroscopic Binaries, spek-tro-skop'ik bin'ar-
éz.
- Spectrum, Spectroscope, spek'trum, spek'trō-skōp.
- Speculum Humanæ Sal-
vationis, spek'ool-oom
hoo-mā'nā sal-vā-ti-ōn'is
or spek'ūl-um hū-mā'ni
sal-vā-shi-ōn'is.
- Speculum Perfectionis,
spek'ool-oom per-fek-
shi-ōn'is.
- Spener, spān'er.
- Spermaceti, sper-ma-sit'ē.
- Sperrylite, sper'il-it.
- Speusippus, spep-siv'poos
or spū-sip'pus.
- Spezia, spā-tsi-a.
- Sphagnum, sfag'num.
- Sphene, sfēn.
- Sphenodon, sfēn'ōd-on.
- Sphex, sfeks.
- Sphinx, sfinks.
- Sphygmograph, sfug'mō-
graf.
- Spica, spē'ka or spik'a.
- Spichern, spich'er-en.
- Spiegel-eisen, spēg'el-iz'en.
- Spielhagen, spē'hā-gen.
- Spielmann, spē'man.
- Spigelia, spi-jēl'i-a.
- Spina Bifida, spin'a bif'id-a.
- Spinazola, spin-ats-ō'l-a.
- Spinello, spin-el'lo.
- Spinifex, spin'if-eks.
- Spinola, spin-ō'l-a.
- Spinosa, spin-ōz'a.
- Spintharoscope, spin-thar'-
is-kōp.
- Spiraea, spi-rē'a.
- Spiranthes, spi-ran'thēz.
- Spire (Speyer), spīrz (spi'-
er).
- Spirifer, spir'if-er.
- Spitzbergen, spits-berg'en.
- Spügen, splüg'en.
- Spöhr, spör.
- Spokane, spē-kān'.
- Spoleto, spē-lēt'o.
- Spondias, spon'di-az.
- Spontini, spon-tē'nē.
- Sporades, spēr'ad-ēz.
- Spörer, spēr'er.
- Sporozoa, spē-ro-zō'a.
- Spree, sprā.
- Sprengel, spreng'el.
- Sprenger, spreng'er.
- Spurzheim, spoorts'hīm.
- Sputum, spūt'um.
- Squarione, skwār-chi-ō'nā.
- Squilla, skwī'lā.
- Srinagar, sri-nug'ur.
- Srirangam, sri-rang'um.
- Srivillipatur, sri-vil-li-pā'-
tur.
- Ssu-mao (Esmote), soo-
mā'ō (es'mōt).
- Staal, stāl.
- Stabat Mater, stā'bat mā'-
ter.
- Stabla, stā'bi-ā or stāb'i-i.
- Stachys, stāk'is.
- Stade, stā'da.
- Stadium, stā'di-oom or
stād'i-um.
- Staël, stā'el.
- Stagirus (Stagira), sta-gē'-
roos (sta-gē'ra), or sta-
jir'us (sta-jir'a).
- Stagnelius, stag-nāl'i-ooos.
- Stahl, stāl.
- Stalactites, stal-ak'tits.
- Stalagmites, stal-ag'nits.
- Stambuloff, stam-bool'of.
- Stanger, stang'er.
- Stanislaw, stan'is-lou.
- Stapfer, stāp-fār'.
- Staraya-Russa, star'a-ya-
roos'sa.
- Stara-Zagora, stā'ra-zag'-
or-a.
- Staro-Byelsk, stā-rō-
bālsk'.
- Starodub, stā-rō-doob'.
- Starokonstantinov, stā-ro-
kon-stan-tēn'ov.
- Stassfurt, stas'foort.
- Statioce, stat'is-ē.
- Statira, sta-tō'ra or stat-
ir'a.
- Statius, stat'i-ooos or stā'-
shi-us.
- Statuto, sta-too'to.
- Staubbach, stoub'bach.
- Stavanger, stā'vang-er.
- Stavesacre, stāvz'ak-er.
- Stavropol, stav'rō-pol.
- Stearic, stēar-ik.
- Stearin, stēar-in.
- Stecchetti, stek-ket'ti.
- Steen, Jan, stān, yan.
- Steenstrup, stān stroop.
- Steenwijk, stān'wik.
- Stefan, stēf'an.
- Steffens, stēf'enz.
- Stein, stīn.
- Steinbok, stīn'bōk.
- Stelnen, stīn'en.
- Steinitz, stīn'its.
- Steinkirk, stīn'kirk.
- Steinmetz, stīn'mets.
- Stellarla, stel-lār'i-a.
- Stellenbosch, stel'len-bosh.
- Selvio, stel'vi-o.
- Stenbock, stān'bōk.
- Stendal, stēn'dal.
- Steno, stān'o.
- Stephan, stēf'an.
- Stephanome, stēf'an-ōm.
- Stephanotis, stēf'an-ōt'is.
- Stepniak, stēp'ni-ak.
- Stercorarius, ster-ko-rār'i-
us.
- Sterculaciæ, ster-kul-ās'i-i.
- Sterlitamak, ster-lit-am-
ak'.
- Sternberg, stērn'berg.
- Stesichorus, stes-ik'ōr-ooos
or stes-ik'ōr-us.
- Stethoscope, steth'ō-skōp.
- Stettin, stēf-tēn' or stēf'in
(Eng.).
- Steuben, stōi'ben.
- Steyn, stān.
- Steyr, stīr.
- Stieler, stēi'er.
- Stier, stēr.
- Stigmara, stig-mār'i-a.
- Stilbite, stil'bit.
- Stilicho, stil'ik-o.
- Stilling, stil'ing.
- Stipules, stip'ūlz.
- Stiver, stiv'er.
- Stjernhjelrn, shēr'n'hyelm.
- Stobæus, stōb-ā'ooos or stōb-
ē-us.
- Stockhausen, stok'houz-en.
- Stockmar, stok'mār.
- Stoke Poges, stōk poj'ez.
- Stolberg, stōl'berg.
- Stomata, stōm'at-a.
- Storax, stōr'aks.
- Storthing, stōr'ting.
- Strabismus, strab-iz'mus.
- Strabo, strā'bō or strāb'ō.
- Stradella, stra-del'la.
- Stradivari, strad-i-vār'i.
- Strahleg, strāl'ek.
- Stralsund, strāl'soont.
- Stramonium, stra-mōn'i-
um.
- Stranraer, stran-rār'.
- Straparola, stran-pa-rō'la.
- Strasbourg, stras'boorg-er.
- Strassburg, stras'boorg.
- Strathcona, strath-kō'na.
- Strathfeldsaye, strath'-
feld-sā.
- Stratiotes, strat-i-ōt'ēz.
- Straton, strā'tōn or strā'-
ton.
- Straubing, strou'bing.
- Strauss, strou's.
- Streatham, streth'am.
- Strellitzia, stel-it'si-a.
- Strepsiptera, strep-sip'ter-a.
- Striegau, strē'gou.
- Strindberg, strind'berg.
- Stromboli, strom'bō-lē.
- Strontium, stron'shi-um.
- Strophanthus, strof-an'-
thus.
- Strossmayer, stros'mi-er.
- Struensee, stroo'en-sā.
- Struve, stroo'va.
- Strychnus, strik'nus.
- Stryj, strē.
- Stuhlweissenburg, stool'-
vis-en-boorg.
- Sturdza, stoor'd'za.
- Sture, stoo'ra.
- Sturm, stoorm.
- Stuttgart, stoot'gart.
- Stuyvesant, sti'ves-ant.
- Stylites, stil-it'ēz.
- Stypticus, stip'tiks.
- Styria, stēr'i-a.
- Styx, stēks or stiks.
- Suakin, swā'kin.
- Suarez, soo-ār'eth.
- Subahdar, soob-ā-dār'.
- Su-chau, soo-chon'.
- Suchet, sū-shā'.
- Sucre, soo'krā.
- Suctoria, suk-tōr'i-a.
- Sudan, soo-dan'.
- Sudermann, sood'er-man.
- Sudetia, soo-det'ik.
- Sudras, soo'dras.
- Sue, sū.
- Sueca, soo-ā'ka.
- Suevi, soo-ā'vē or swēv'i.
- Suffren, sūf-ran'.
- Suhl, sūh'l.
- Suhm, soom.
- Suidas, soo'id-as.
- Sui Juris, soo'ē yoor'is or
soo'i joor'is.
- Suir, shoor.
- Suja, soo'ja.
- Sukkur, suk-kur'.
- Sulaiman, soo-lā-mān'.
- Suleiman, soo-lā-mān'.
- Sulina, soo-lē'na.
- Suliotēs, soo-li-ōt's.
- Sulla, sool'la.
- Sulphonal, sulf'on-al.
- Sulpicius, sool-pēk'i-ooos or
sul-pith'i-us.
- Sultanpur, sool-tān-poor'.
- Sulu, sool'oo.
- Sulzer, sool'tser.
- Sumach, sū'mak.
- Sumarokov, soo-mā-ro'kof.
- Sumatra, soo-mā'tra.
- Sumbawa, soom-bā'wa.
- Sumbul, sum'bul.
- Sumy, soo'mi.
- Sunda, soon'da or sun'da
(Eng.).
- Sundsvall, soondz'val.
- Sundt-Hansen, soont'hān-
sen.
- Sungei Ujong, soon-gā' oo-
jong'.
- Sunium, soo'ni-oom or sun'-
i-um.
- Sunnis, soon'nēz.
- Suonada, soo-o-nā'da.
- Suppé, soop'pa.
- Surabaya, soo-ra-bā'ya.
- Surakarta, soo-ra-kār'ta.
- Surat, soo-rat'.
- Surcouf, sūr-koof'.
- Surya, soor'ya.
- Suryasiddhanta, soor'ya-
sid-d'han'ta.
- Sus, soos.
- Susa, soo'za.
- Susten, soos'ten.
- Sutlej, sut'lej.
- Suwalki, soo-wāl'ki.
- Suwanee, soo-wā'nē.
- Suzdal, sooz'dal.
- Svastika, svas'ti-ka.
- Sveaborg, svā'a-bor.
- Svearika, sti'ves-ant.
- Svendborg, svend'bor.
- Svendsen, svend'sen.
- Sverdrup, svär'droop.
- Swaheli, swa-hā'l'i or swa-
hē'li.
- Swakopmund, swā'kop-
moond.
- Swami, swā'mi.
- Swammerdam, swam'er-
dam.
- Swanetia, swan-ē'shi-a.
- Swaziland, swā'zi-land.
- Swedenborg, svād'en-bor.
- Swetchine, sve'chēn-ā.

Swineimünde, svē-ne-mün'-da.
 Sybaris, sūb'ar-ia or sib'ar-is.
 Sybel, zē'bel.
 Syenite, si'en-it.
 Sylhet, sil-het'.
 Syllabus, sil'ab-us.
 Sylviada, sil-vi'd-ē.
 Symbiosis, sim-bi-ōs'is.
 Symmachus, sim'mak-us.
 Symphoricarpus, sim-for-i-kar'pus.
 Symposium, sim-pōz'i-um.
 Syncretism, sin'kret-izm.
 Synesius, sūn-ās'i-ōos or sin-ēs'hi-us.
 Synovial, sin-ōv'i-al.
 Syntonin, sin'ton-in.
 Syphax, sū'faks or si'faks.
 Syracuse, si'ra-kūs.
 Syr Daria, sēr-dar'ya.
 Syringa, si-riū'ga.
 Syrinx, sū'rinks or sir'inks.
 Syrlin, sēr'lin.
 Syrtes, sūr'tās or sir'tēz.
 Sysstia, sūs-sit'i-a or sis-sit'i-a.
 Syzigy, si'zi-ji.
 Syzran, siz-ran'.
 Szabadka, so-bod'ko.
 Szalay, sā'li.
 Szarvas, sor'vosh.
 Szatmár-Németi, sot'már-nām-et'i.
 Sze-chuen, sā-choo'en.
 Szegedin, seg'ed-in.
 Szentes, sen-tesh'.
 Szolnok, sol'nok.
 Taaffe, tā'fa.
 Taal, tál.
 Tabari, tā'ba-rē.
 Tabashir, tab-a-shēr'.
 Tableaux Vivants, tab-lō'vi-vān'.
 Tacna, tak'na.
 Tacoma, ta-kō'ma.
 Taconian, tak-ōn'i-an.
 Taconia, tak-sōn'i-a.
 Tael, tál.
 Tafilet, ta-fl-elt'.
 Taganrog, ta-gan-rog'.
 Tagliacozza, ta-ly-a-kot'so.
 Taglioni, ta-lyō'nē.
 Tahiti, ta-hē'tē.
 Tallandier, tai-yaŋ-di-ā'.
 Taillé, tai-yā'.
 Taillefer, tai-y'-fār'.
 Tainan, tū-nān'.
 Taine, tān.
 Tai-Ping, tī-ping'.
 Tai-yuan-fu, tī-yoo-an-foo'.
 Tajiks, tā'jiks.
 Taj-mahal, táj-ma-hāl'.
 Takla-makan, tak-la-mak-ān'.
 Takow, ta-kou'.
 Taku, ta-koo'.
 Talamanicans, ta-la-man'-kanz.
 Talavera de la Reina, ta-la-vá-ra dá la-rē-ā'na.

Talchir, tal-cher'.
 Talegalla, tā-leg'al-a.
 Talé Sap, tā-lá-sap'.
 Ta-lien-wan, tā-li-en-wān'.
 Ta-li-fu, tā-lē-foo'.
 Tallahassee, tal-la-has'ē.
 Tallemant des Réaux, tal-l'-man-tā-rā-ō'.
 Talleyrand de Périgord, tal-le-ran'-d'-pā-ri-gōr'.
 Tallien, tal-li-an'.
 Talus, tā'lus.
 Tamaqua, tam-a'kwa.
 Tamariscinaea, tam-ar-is-sin-ā-cē-cē.
 Tamatave, ta-ma-tā'vā or tā-mā-tāv' (Fr.).
 Tamaulipas, ta-mou-lé'pas.
 Tamayo y Baus, ta-mā-yo-i-bous'.
 Tambov, tam-bof'.
 Tamil, tā'mil.
 Tammany, tam'man-ē.
 Tamarfors, tam'er-fors.
 Tammuz, tam'mooz.
 Tampico, tam-pē'ko or tam'pe-ko.
 Tamsui, tam-soo'i.
 Tamus, tam'us.
 Tanagers, tan'aj-erz.
 Tanagra, tan'ag-ra.
 Tanais, tan'ā-is.
 Tanaland, tā'na-land.
 Tananarive, ta-na-na-rē'vā.
 Tanda, tān'da.
 Tanga, tāng'a.
 Tanganyika, tan-gan-yē'ka.
 Tanghinin, tan'gin-in.
 Tangier, tan-jēr'.
 Tanguts, tan-goots'.
 Tanis, tā'nis.
 Tanjore, tan-jōr'.
 Tannhäuser, tan-hoi'zer.
 Tansillo, tan-sil'lo.
 Tantalum, tan'tal-um.
 Tantalus, tan'tal-cos or tan'tal-us.
 Tantras, tan'tras.
 Taormina, ta-or-mē'na.
 Tara, tā'ra.
 Tarai, tā-ri'.
 Taranaki, ta-ra-nā'kē.
 Taranto, tā'ran-to.
 Tarapacá, ta-ra-pa-kā'.
 Tarare, tā-rār'.
 Tarascans, ta-ras'kanz.
 Tarascon, ta-ras-kon'.
 Tarashcha, ta-rash'cha.
 Tarawera, ta-ra-wā'ra.
 Taraxacum, ta-rak'sa-kum.
 Tarazona, ta-ra-thō'na.
 Tarbagatai, tar-ba-ga-tī'.
 Tarbes, tarb.
 Tardigrada, tar-di-grā'da.
 Tarentum, tar-en-tum.
 Targoviste, tar-go-vēst'ā.
 Tarifa, tā-rē'fa.
 Tarim, tā-rēm'.
 Tarn-et-Garonne, tārn-ā-ga-ron'.
 Tarnopol, tar-nō'pol.
 Tarpon, tar'pon.
 Tarquinii, tar-kwin'i-i.

Tarragon, tar-a-gon.
 Tarragona, ta-ra-gō'na.
 Tarshish, tar-shēsh'.
 Tarsipes, tar'si-pēz.
 Tartarus, tar'tar-us.
 Tartini, tar-tē'nē.
 Tarudant, ta-roo-dant'.
 Tasgaon, tas-goun'.
 Tashkend, tash-kent'.
 Tassoni, tas-sō'nē.
 Tata, tā'ta.
 Tatar-Pazardzik, ta-tar'-pa-zar-jēk'.
 Tatian, tā'shi-an.
 Tattus, tā'ti-ōos or tā'shi-us.
 Tauchnitz, touch'nits.
 Tauler, tou'ler.
 Taung-ngu, toung-ngoo'.
 Taunus, toun'ōos.
 Taupo, tou'po.
 Tauranga, tou-ran'ga.
 Taurida, tou'id-a.
 Taurus, tou'rūs.
 Tautog, tou'tog.
 Tavastehus, ta-vas'tā-hoos.
 Tavernier, ta-ver-ni-ā'.
 Tavira, tā-ve'ra.
 Tchibichev, cheb-ich-ef'.
 Tchernalev, cher-na-yef'.
 Tchernyshevsky, cher-ni-shef'ski.
 Tchikhatchev, chi-ka-cher'.
 Tecoma, tek-ōm'a.
 Tecumseh, tek-um'si.
 Te Deum Laudamus, tā-dā'oom lou-dā'moos or té-d-um loud-ām'us.
 Tegoe, tā-gā'a or té-jē'a.
 Tegern-See, tēg'ern-zā.
 Tegethoff, teg-et-hof.
 Tegetmeyer, teg-et-mi'er.
 Tegnér, teg-nār'.
 Tegucigalpa, te-goo-si-gal'-pa.
 Teheran, tā-her-ān' or te-h-rān'.
 Tehuantepec, tā-wan-tā-pek'.
 Tehuelches, tā-wel'chās.
 Telaf, tā-laf'.
 Telamon, tel'am-on.
 Teleosaurus, tel-e-o-sour'-us.
 Tell-el-Amarna, tel-el-am-ār'na.
 Tell-el-Kebir, tel-el-keb-ēr'.
 Tellicherry, tel-li-cher'rē.
 Telshi, tel'shi.
 Telugu, tel-oo-goo'.
 Tembuland, tem'boo-land.
 Temenos, tem'en-os.
 Temesvár, tem-es'h-vār'.
 Temps, tan.
 Tenasserim, ten-as-ser'im.
 Tenedos, ten'ed-os.
 Ten Kate, ten-kā'tā.
 Tennerann, ten'a-man.
 Tentaculites, ten-tak'ūl-its.
 Teocalli, tā-ō-kā'lyi.
 Teplitz, tep'lits.

Teramo, ter'a-mo.
 Teraphim, ter'af-im.
 Terburg, ter'boorg.
 Terebratula, ter-eb-rat'-ū-l-a.
 Teredo, ter-ēd'o.
 Terek, tā-rek'.
 Terespol, tā-rās'pol.
 Ternate, ter-nā'tā.
 Ternaux-Compans, tār-nō'-kom-pay'.
 Terni, tār'nē.
 Ternströmia, tern-strēm'-i-a.
 Terpenes, ter'pēnz.
 Terracina, ter-ra-che'na.
 Terranova, ter-ra-nō'va.
 Terre Haute, tār-ōt'.
 Terrien de la Couperie, tēr-ri-an'-d'-la-koo-p'-rē'.
 Terschelling, ter-schel'ing.
 Tertullian, ter-tul'i-an.
 Ternel, tā-roo-el'.
 Teschen, tesh'en.
 Tesla, tes'la.
 Testamentum Domini, tes-ta-men'toom dom'in-i or dom'in-i.
 Tetanus, tet'an-us.
 Tête-de-Pont, tāt-d'-pon'.
 Teton, tā'ton.
 Tetuan, tet-oo-an'.
 Tetzels, tet'sel.
 Teuffel, toi'fel.
 Teutoburger Wald, toi'to-boorg-er-valt.
 Teutones, tū'ton-ēz.
 Tewfik, tā'fik.
 Texarkana, teks-ar-kan'a.
 Tezcatlipoca, teth-kat-li-pō'ka.
 Thaarup, tō'roop.
 Thalamus, thal'am-us.
 Thalberg, tal'berg.
 Thales, thāl'ās or thāl'ēz.
 Thalictrum, tha-lik'trum.
 Thallium, thal'i-um.
 Thamugas, tha-moo'gas.
 Thamyras, tha-mū'ris.
 Thana, thā'na.
 Thapsacus, thap'sa-koos or thap'sa-kus.
 Tharawadi, tha-ra-wā'di.
 Thasos, thā'sos.
 Thayet-myo, tha-yet-mi'o.
 Theatines, thē'at-inz.
 Thebes, thā'bās or thēbz.
 Theiss, tīs.
 Telemark, tā'lā-mark.
 Themistius, thām-is'ti-ōos.
 Themistocles, thām-is'tō-k-lās or them-is'tok-lēz.
 Thénard, tā'nār'.
 Theobroma, thē-o-brō'ma.
 Theobromine, thē-o-brō'-mūn.
 Theocritus, thā-ok'rit-ōos or thē-ok'rit-us.
 Theodectes, thā-o-dek'tās or thē-o-dek'tēz.
 Theodelinda, thē-o-del-in'-da.
 Theodoric, thē-od'or-ik.

Appendix of Pronunciation.

- Theodorus**, thā-o-dōr'ōos or thē-o-dōr'us.
Theodosius, thā-o-dō'si-ōos or thē-o-dōsh'i-us.
Theophany, thē-ōf'an-i.
Theophilanthropism, thē-o-fil'an thrōp-izm.
Theophilus, thā-ō'fil-ōos or thē-ō'fil-us.
Theophrastus, thā-o-fras'-toos or thē-o-fras'tus.
Thera, thā'ra or thēr'a.
Theramenēs, thār-am'en-ās or thēr-am'en-ēz.
Therapeutē, ther-a-pū'tē.
Therapia, ther-ā'pi-a.
Therisenstadt, ter-ā'zi-en-stat.
Theressopolis, tār-ās-o'pol-is.
Therezina, tār-ez-ē'na.
Thermidor, tār-mi-dōr'.
Thermograph, ther'mo-graf.
Thermometer, ther-mom'-et-er.
Thermopylæ, thār-mo-pē'-lā or ther-mop'i-i.
Theron, thā'rōn or thēr'on.
Thersites, ther-sē'tās or ther-sit'ēz.
Theseus, thes-ā'ōos or the'sus.
Thesmophoria, thes-mo-for'i-a.
Thespiæ, thes'pi-ā or thes'pi-i.
Thespiæ, thes'pis.
Theuriet, te-rē-ā'.
Thian-shan, ti-an-shān'.
Thibaudin, tē-bō-dan'.
Thibaut, tē-bō'.
Thielt, tēlt.
Thierry, tē-er-rē'.
Thiers, tē-ār'.
Thingvall, vatn, thing-val'la-vat'n.
Thio, thi'ō.
Thlophone, thi'ō-fēn.
Thisted, tis'ted.
Thlinkits, thlin-kēts'.
Tholen, to'en.
Tholuck, to'look.
Thomasius, tom-ās'i-ōos.
Thoracic, thōr-as'ik.
Thorbecke, tōr-bek-a.
Thoreau, thōr-ō'.
Thoren (Thorild), tōr'en (tōr'il).
Thorium, thōr'i-um.
Thorn (town), torn.
Thoroddsen, thōr-od'sen.
Thorwaldsen, tōr-vāld'sen.
Thou (Thuanus), too (to-ō'noos or thoo-ān'us).
Thourout, too-roo'.
Thrasylbus, thra-sū-boō'-loos or thras-ib-ūl'us.
Thrasymachus, thra-sū'-ma-kōos or thras-im'-ak-us.
Thrombosis, throm-bōs'is.
Thucydides, thoo-kū'd'id-ās or thoo-sid'id-ēz.
Thule, thoo'lā or thool'ē.
Thuret, tū-rā'.
Thurgau, too'r'gou.
Thurri, thoo'ri-i.
Thurles, thuriz.
Thurn, toorn.
Thurot, tū-rō'.
Thurstan, thoor-stān'.
Thuya (Thuja), thū'ya (thū'ja).
Thylacine, thi'la-sin.
Thyme, tim.
Thymelacæ, tim-el-ā'sē-ē.
Thymol, tim'ol.
Thymus, tim'us.
Thyroid, thir'oid.
Thyrus, thār'soos or ther'sus.
Thysanura, thi-shān-ūr'a.
Tiara, ti-ār'a.
Tiberias, ti-bā'ri-as or ti-bēr'i-as.
Tiberius, ti-bā'ri-ōos or ti-bēr'i-us.
Tibet, tib'et or tib-et'.
Tibullus, ti-bool'ōos or ti-bul'us.
Ticino (Tessin), ti-chē'no (tes-san').
Ticonderoga, ti-kon-der-ō'-ga.
Ticunas, ti-koo'nas.
Tiele, tē'la.
Tientsin, ti-en-tsēn'.
Tiepolo, ti-ep'ō-lo.
Tierra del Fuego, ti-er'ra del foo-ā'go.
Tiflis, tif'lis.
Tigellinus, ti-gel-lē'noos or ti-jel-in'us.
Tigliath-Fileser, tig-lath'-pil-ās'er.
Tigranes, tig-rān'ās or tig-rān'ēz.
Tigré, tig'rā.
Tigre, ti grā.
Tigridia, ti-grid'i-a.
Tikhvin, tikh-vin'.
Tilburg, til'boorg.
Tilhar, til-hur'.
Tillacæ, til-i-ā'sē-ē.
Tillandsia, til-land'si-a.
Tillemont, tēl-mon'.
Tillconltry, til-i-koo'tri.
Tillodont, til-ō-dont'.
Tilstit, til'sit.
Timeus, ti-mā'ōos or tim-ē'us.
Timaru, ti-mā'roo.
Timbuctoo, tim-buk-too'.
Timoleon, ti-mō'lē-on.
Timor, tē-mōr'.
Timor-Laut, tē-mōr-lout'.
Timotheus, ti-mō'thā-ōos or tim-ō'thus.
Timucuas, ti-moo-koo'as.
Timur Beg, ti-moor' beg.
Tinamou, tin'a-moo.
Tinchebrai, tan-sh-brā'.
Tinea, tin-ē-a.
Tinevell, tin-ev-el'i.
Tintara, tin-tār'a.
Tintoretto tin-tōr-et'to.
Tipperah, tip'er-a.
Tippoo Tib, tip-poo-tib'.
Tipu Sahib, tip'poo šā'hīb.
Tiraboschi, tē-ra-bō's'ki.
Tirab, tē'ra.
Tiraspol, tē-ras'pol.
Tiresias, tē-rā'si-as or tir-ēs'i-as.
Tirhut, tir-hoot'.
Tiridates, ti-ri-dā'tās or tir-id-āt'ēz.
Tirlemont, tēr-l'f-mon'.
Tirnov, tēr-nō'vo.
Tiro, tē'ro or tir'ō.
Tirso de Molina, tēr'so dā mō-lē'na.
Tirupati, tē-roo'put-i.
Tirupatur, tē-roo'put-ur.
Tiruvannamalai, tē-roo-vun-un-al'y.
Tiryas, tir-ūns' or tir-inz'.
Tischendorf, tish'en-dorf.
Tissaphernes, tis-sa-fer'nās or tis-sa-fer'nēz.
Tisserand, tis-s'r-an'.
Tisza, ti'sa.
Titanium, ti-tān'i-um.
Tithonus, ti-thōn'ōos or ti-thōn'us.
Titian (Tiziano), ti'shi-an (ti-tsi-ā'no).
Titicaca, ti-ti-ka'ka.
Titien (Tietjens), ti'shenz (tēt'yenz).
Titus, tē'toos or tit'us.
Tityos, ti'tū-os or tit'i-os.
Tiumen, tū'men.
Tivoli, tē'vo-li.
Tobago, to-bā'go.
Tobolsk, to-bols'k'.
Toboso, to-bō'so.
Toccata, tok-kā'ta.
Tocqueville, tok-vēl'.
Todea, to-dē-a.
Tōdi, tē'di.
Todleben, tot'lāb-en.
Togo, tō'go.
Tokay, to-kā'.
Tokoly, tē'ke-li.
Tokyo, tōk'i-o or tok'yo.
Toledo, to-lā'do.
Toledoth Jeshu, tōl'dōth yā'shoo.
Tolentino, to-len-tē'no.
Tolosa, to-lō'sa.
Tolstoi, to'l'stoi.
Toluca, to-loo'ka.
Toluene, to-lū-ēn.
Toluidine, tol-ū'id-in.
Tomaszew, to-mā'shov.
Tommaseo, tom-ma-sā'ō.
Tonawanda, ton-a-won'da.
Tongariro, tong-a-rē-ro.
Tongres, tong'r'.
Tonikas, ton'ik-az.
Tonga, tong'a.
Tönsberg, tenz'berg.
Topeka, to-pē'ka.
Topellius, to-pā'li-ōos.
Topffer, tep fer.
Torah, tō'ra.
Torenia, to-rēn'i-a.
Toreno, to-rā'no.
Torfæus, tor-fā'ōos.
Torgau, tōr'gou.
Torjok, tor-zhok'.
Tormenitil, tor'men-til.
Torneå, tor'ne-ō.
Toronto, tō-rōn'to.
Torquatus, tor-kwā'toos or tor-kwā'tus.
Torquemada, tor-kā-mā'-da.
Torre Annunziata, tor'rā an-nōon-tsi-ā'ta.
Torre del Greco, tor'rā del grā'ko.
Torre Pellice, tor'rā pel'li-chā.
Torres Vedras, tor'rās vā'-dras.
Torricelli, tor-ri-chel'li.
Torrignano, tor-ri-ji-ā'no.
Torstensson, tor'stens-son.
Tortona, tor-tō'na.
Tortosa, tor-tō'sa.
Toru Dutt, to-roo-dut'.
Totana, to-tā'na.
Totila, tō'ti-la.
Toul, tool.
Toulon, too-lon'.
Toulouse, too-looz'.
Toung-ngu, toung-ngoo'.
Touraco, too-rak'ō.
Touraine, too-rān'.
Tourane, too-rān'.
Tourcoing, toor-kwān'.
Tourmente, toor-mānt.
Tournal, toor-nā'.
Tournesfort, toor-n'fōr'.
Tourniquet, toor-ni-ket.
Toussaint, L'Ouverture, too-san' loo-vār-tūr'.
Trachea, trā'ki-a.
Trachonitis, tra-ko-nē'tis or tra-ko-ni'tis.
Trachyte, trak'it.
Tradescantia, tra-des-kan'-shi-a.
Tragacanth, trag'ak-anth.
Tragopan, trag'o-pan.
Trani, trā'ni.
Tranquebar, tran-kwi-bār'.
Trans-Alai, trans-al'i.
Transbaikalia, trans-bi-kāl'i-a.
Transkel, trans-kē'.
Transvaal, trans-vāl'.
Trapa, trap'a.
Trapezium, trap-ēz'i-um.
Trasimene, tras'im-ēn.
Traunsee, troun zā.
Trautenau, trout'en-ou.
Travancore, trav-an-kōr'.
Travertin, trav'er-tin.
Traz-os-Montes, traz-ōs-mon'tāz.
Trebelli, tre-bel'li.
Treibitsch, trā'bich.
Treibzond, treb'iz-ond.
Trebonius, tre-bō'ni-ōos or tre-bō'ni-us.
Trégulier, trā-gi-ā'.
Trichtschke, trich'ka.
Trematodes, trem-at-ōdz.
Tremolo, trem-ōl-o.

- Trendelenburg, trend'el-en-boorg.
 Trèves, træv.
 Trevisa, tre-vé'sa.
 Treviso, tre-vé'so.
 Triangulum Australe, tri-an-gū-lum ous-trāl'é.
 Triassic, tri-as'ik.
 Tribonianus, tri-bō-ni-ā'-noos or tri-bō-ni-ān'us.
 Trichina, tri-ki'na.
 Trichiniasis, tri-ki-ni'as-is.
 Trichinopoli, tri-chin-op'-ol-i.
 Trichomanes, tri-kom'an-éz.
 Trichinium, tri-klén'i-oom or tri-klén'i-um.
 Tricouplis, tri-koo'pis.
 Trierarch, tri'er-ark.
 Trieste, tri-es'tā.
 Trikkala, trik'ka-ls.
 Trilobites, tril'ob-its.
 Trimurti, tri-moor'ti.
 Trincomali, trin-ko-mal-é'.
 Trinobantes, tri-no-ban'tās or tri-no-ban'téz.
 Trinoda Necessitas, tri-nō'-da ne-kes'it-as.
 Tripoli, tri-pōl-i.
 Tripolitza, tri-pol-it'sa.
 Triptolemus, trip-tol'em-ous or trip-tol'em-us.
 Triptych, trip'tik.
 Trisagion, tris-äg'i-on.
 Trissino, tris-sé'no.
 Tristan Da Cunha, tris'tan da koo'nyā.
 Triticum, trit'ik-um.
 Trivandrum, tri-van'drum.
 Trochee, trō'ké.
 Trochu, trō-shū'.
 Troctolite, trōk'to-lit.
 Troezen, troi-zān' or troi-zén'.
 Trollus, trō'il-ous or trō'il-us.
 Troitsk, troitsk.
 Trollhätta, trol-het'ta.
 Trondhjem, tron'hjem.
 Tropæolum, trō-pi-ōl'um.
 Troubadours, troo-ba-doorz'.
 Trouvère, troo-vār'.
 Troyes, trwā.
 Troyon, trwā-yon'.
 Trübner, trüb'ner.
 Trujillo, troo-hél'yo.
 Trypanosome, tri-pan-o-sōm'.
 Tsaritsyn, tsā-rit-sin'.
 Tsarskoe Selo, tsars'ko-ya-se-lo'.
 Tschalkovsky, chi-kov'ski.
 Tschudi, choo'di.
 Tseng-kwo-fan, tsāng-kwo-fan'.
 Tsetse, tset'si.
 Tsimshians, tsim'shē-anz.
 Tsou-hsien, tsou-hse-en'.
 Tübingen, tü'bing-en.
 Tubuai, too-boo-i'.
 Tuckahoe, tuck-a-hō.
 Tucuman, too-koo-man'.
 Tudela, too-dā'la.
 Tugela, too-gā'la.
 Tugenbund, toog'en-boont.
 Tula, too'la.
 Tull, too'li.
 Tulle, too'l.
 Tullianum, tool-li-ā'noom or tool-li-ān'um.
 Tung-kuan, toong-kwān'.
 Tunicata, tü-ni-kā'ta.
 Tupi-Guarani, too'pi-gwa-rā'ni.
 Turenne, tü-ren'.
 Turfan, toor-fān'.
 Turgeniev, toor-gen'yef.
 Turgot, tür-gō'.
 Turkestan, toor-kes-tān'.
 Turkmanshai, toork-man-shi'.
 Turnebus, toor'neb-ous.
 Turnus, toor'noos or tur'nus.
 Turnu-Severin, toor-noo'-sāv-ār-ēn'.
 Turretin, tür-et-an'.
 Tuscaroras, tus-kar-ō-rās.
 Tussilago, tus-si-lā'go.
 Tuttinglen, toot'ling-en.
 Tyche, tü'kā or tik'é.
 Tyndareus, tün-dār-ā-ous or tün-dār'i-us.
 Typhaceæ, ti-fās-ē-ē.
 Tyrrau, tēr'au.
 Tyrteus, tür-tā-ous or tirt-ē-us.
 Tze-hsi, tsā-hsē'.
 Ubeda, oo-bā'da.
 Uchi, oo'chi or yoo'chi.
 Uccello, oo-chel'lo.
 Udaipur, oo-di-poor'.
 Uddevalia, oo'de-val-lā.
 Udine, oo'di-nā.
 Udong, oo-dong'.
 Ueberweg, ü'ber-vek.
 Ufa, oo-fā'.
 Uganda, oo-gan'da.
 Ugolino della Gherardesca, oo-gō-lē'no del'la gār-ar-des'ka.
 Uhde, oo'da.
 Uhländ, oo'land.
 Uitenhage, oit-en-hā'ga.
 Ujiji, oo-jē'jē.
 Ukase, ü'kās.
 Ujjain, ooj'in.
 Uleåborg, oo'le-o-bor.
 Ulema, ü-lē'ma.
 Ulex, ü'l'ex.
 Ullasutai, oo-lyas-ü-ti.
 Uliflas, ool'fl-as.
 Ullmann, ool'man.
 Ulm, oolm.
 Ulpiaz, ülp'i-an.
 Ulrici, ool-rē'tsi.
 Ulrika, ool-rē'ka.
 Ulrimus Hæres, ool'ti-moos-hā'rās or ul'tim-us hēr-éz.
 Ulitor, ool'tör or ul'tor.
 Ultramontane, ul-tra-mon'tān.
 Ultra vires, ool'tra vē'rās or ul'tra vi'rēz.
 Umā, oo-mā'.
 Uman, oo-man'.
 Umballa, um-bāl'la.
 Umbelliferæ, um-bel-if-er-ē.
 Umlaut, oom'lout.
 Unger, oong'er.
 Ungulata, un-gū-lā'ta.
 Unterwalden, oon'ter-vald-en.
 Upanishads, oop-an-i-shadz'.
 Upsala, oop'sal-a.
 Uræmia, ür-ēm'i-a.
 Uralsk, oor-alsk'.
 Uranium, ür-ān'i-um.
 Uranometria, ür-an-o-met-ri-a.
 Uranus, oo-rā'noos or ür-an'us.
 Ura-tiube, oo-ra-tyoo'bā.
 Urbi et Orbi, ur'bē et or'bē.
 Urbino, oor-bē'no.
 Urfé, ür-fā'.
 Urga, ür'ga.
 Urgeuj, oor-geuj'.
 Uri, oo'ri.
 Uriu, oo-rē'oo.
 Urmar Tanda, oor'mur-tan'da.
 Ursa Major, oor'sa mä'yör or ur'sa mä'jör.
 Ursa Minor, oor'sa mē'nör or ur'sa min'ör.
 Urticaceæ, ür-tik-ās-ē-ē.
 Urticaria, ür-tik-ār'i-a.
 Uruguay, oo-roo-gwi'.
 Uruguayana, oo-roo-gwi-a-na.
 Urumiyah, oo-room-ē'ya.
 Urumtsi, oo-room'tsi.
 Usedom, oo'ze-dom.
 Usertesen, oo-ser-tā'sen.
 Ussuri, oos-soo'ri.
 Ustyug-Velikii, oost-üg'-vel-ék-ē'.
 Utes (Utahs), üts (ü'taz).
 Utica, oo'ti-ka or üt'ik-a.
 Utopia, üt-öp'i-a.
 Utraquists, ü'tra-kwists.
 Utrecht, oo-trech't'.
 Utrera, oo-trā'ra.
 Uxmal, oosh-mal'.
 Uzbeys, ooz'begs.
 Vaalpens, vāl'penz.
 Vacciniaceæ, vak-sin-i-ā-sē-ē.
 Vacherot, vā-sh'r-ō'.
 Vaquerie, vā-k'r-ē'.
 Vadstena, vad-stā'na.
 Vaga, vā'ga.
 Vaishnavas, vish'na-vaz.
 Vaisyas, vī'shyas or vī'syas.
 Valabacharya, va-lā-b'hā'-chur-ya.
 Valais, vā-lā'.
 Valckenaer, vāl'k'n-är.
 Valdepeñas, val-dā-pā'-nyas.
 Val de Travers, val-d'-tra-vär'.
 Valdivia, val-dē'vi-a.
 Valence, val-āns'.
 Valencia (Ireland), val-en-shi-a.
 Valencia (Spain), val-en-thi-a.
 Valenciennes, va-lan-si-en'.
 Valentinus, va-len-tē'noos or va-len-tin'us.
 Valenza, va-len'tsa.
 Valera y Alcala Galiano, va-lā'ra i al-ka-lā'-ga-li-ā'no.
 Valeriana, val-er-i-ān'a.
 Valerianaceæ, val-er-i-an-ā'sē-ē.
 Valetta, va-let'ta.
 Valguarnera, val-gwar-nā'-ra.
 Valkyries, vāl'kir-ēz or val-kē'rēz.
 Valladolid, vā-lyā-dō-lid'.
 Vallauri, val-lou'ri.
 Valle, val'lā.
 Vallejo, val-yā'hō or val-lā'-ho.
 Vallisneria, val-lis-ner'i-a.
 Vallombrosa, val-om-brō'-za.
 Valmy, val-mē'.
 Valois, vāl-wā'.
 Valparaiso, val-pa-rī'so.
 Valtellina, val-tel-lē'na.
 Vambéry, vam'bā-ri.
 Vanadium, van-ād'i-um.
 Van Beers, van-bärz'.
 Vandamme, van-dam'.
 Van der Goos, van-der-goos'.
 Van de Velde, van-de-vel'-da.
 Van Dyck, van-dik'.
 Vanesa, van-es'a.
 Vanillin, van'il-lin.
 Vanini, van-ēu'i.
 Vanloo, van-lō'.
 Vapereau, vā-p'r-ō'.
 Varangians, var-an'ji-anz.
 Vardö, vard'e.
 Varennes, var-en'.
 Varese, var-ā'sā.
 Varnhagen von Ense, farn'-häg-en fon en'sa.
 Varuna, vā'roo-na.
 Vasari, vā-sā'ri.
 Vasconcellos, vas-kon-sel'-los.
 Vasilkov, va-sil'kof.
 Vatinius, va-tē'ni-ous or vat-in'i-us.
 Vatna-Jökull, vat'na-ye'-kool.
 Vauban, vō-ban'.
 Vauchuse, vō-klüz'.
 Vaud, vō.
 Vaudeville, vō-d'-vél'.
 Vauvenargues, vō-v'n-arg'.
 Vedas, vā'das.
 Vedism, vā'dism.
 Vega (star), vē'ga.
 Vega (writers), vā'ga.

- Vehmgericht**, vām'ge-richt.
Veil, vāi or vēi.
Veit, vit.
Veijle, vi'la.
Velasquez, ve-las'kath.
Velez Malaga, vā'leth mā'-la-ga.
Velez Rubio, vā'leth roo'-bi-o.
Vella, vā'li-a.
Velij, vā-lēzh'.
Velletri, vel-lā'tri.
Vellozia, vel-oz'i-a.
Vendée, van-dā'.
Vendémiaire, van-dā-mi-ār'.
Vendôme, van-dōm'.
Venediger, ven-ād'ig-er.
Vener, vā'ner.
Veneri, ven-et-i.
Venezianov, ven-āz-yan'of.
Venezuela, vā-nāth-wā'la.
Veni, Creator Spiritus, vā'ni krā-ā'tor spērit-ooz or ven'i krē-ā'tor spērit'-us.
Venosa, ve-nō'za.
Ventidius, ven-tid'i-ooz or ven-tid'i-us.
Ventimiglia, ven-ti-mē-lyi-a.
Ventriculites, ven-trik'ū-lits.
Venusberg, vā'noos-berg.
Vera, vā'ra.
Vera Cruz, vā'ra-krooth.
Veranillo, vā-ra-ni'lyo.
Verano, vā-rā'no.
Verapoli, ver-ap'ol-i.
Veratrine, ver-a-trin.
Veratrum, ver-ā'trum.
Verawal, ver-a-wāl'.
Verbenaceæ, ver-bēn-ā'cē-ē.
Verboeckhoven, ver-book-hō'ven.
Vercelli, ver-chel'li.
Vercingetorix, wer-kin-get'ō-riks or ver-sin-get'-or-iks.
Verde-antique, verd-and'tēk'.
Verdi, vār'di.
Verditer, ver'dit-er.
Verdun, vār-dun'.
Vereeniging, ver-ān'ig-ing.
Verestchagin, ver-es'cha-gen.
Verga, vār'ga.
Vergennes, vār-zhen'.
Vergnauud, vār-nyi-ō'.
Verkhnē-Dnieperovsk, verch'nē-dnyāp-rovsk'.
Verkhojansk, ver-cho-jansk'.
Verlaine, vār-lān'.
Vermeer, ver-mār'.
Vermicelli, ver-mi-chel'li.
Verne, vārn.
Vernet, vār-nā'.
Verolanium, ver-o-lām'i-oom or ver-o-lām'i-um.
Verona, vā-rō'na.
Veronese, vā-rō-nā'zā.
Veronica, vā-rōn'ik-a.
Vorres, ver'rās.
Verrocchio, vār-ok'ki-o.
Versailles, vār-sā'y'.
Verulam, ver-ū-lam.
Verus, vā'roos or vē'r-us.
Verviers, ver-vi-ā'.
Vesalius, vā-sā'li-ooz.
Vespucci, Amerigo, ves-pooch chi, a-mā-rē'go.
Vesterås, vest'er-ōs.
Veuillot, ve-yō'.
Vevey, vē-vā'.
Vexiō, vek'shi-e.
Viadana, vē-a-dā'na.
Via Mala, vē-a-mā'la.
Viareggio, vē-a-rej'i-o.
Viaticum, vē-ā'ti-koom or vē-ā'ti-kum.
Viau, vē-ō'.
Vibert, vē-bār'.
Vieborg, vē'börg.
Vibrio, vi-bri-ō.
Viburnum, vi-bur'num.
Vicenza, vi-chen'tsa.
Vicente, vi-sen'tā.
Vichy-les-Bains, vē-shi-lā-ban'.
Vico, vē'ko.
Vicuña, vi-koon'ya.
Vida, vē'da.
Vidal, vē-dal'.
Vidocq, vē-dok'.
Vielle, vē-ā'y'.
Vieira, vē-ā'ra.
Vienna, vē-en'na.
Vienne, vē-en'.
Viersen, fēr'zen.
Vierzon, vi-ār-zon'.
Vieta (Viète), vē-ā'ta (vē-āt').
Vieuxtemps, vye-tan'.
Vigan, vē-gan'.
Vignosso, vig'foos-son.
Vigevano, vē-jā-vā'no.
Vigilantes, vi-gi-lan'ti-ooz or vij-il-an'shi-us.
Vigna, vē'nyā.
Vignola, vē-nyō'la.
Vigny, vē-nyi'.
Vigo, vē'go.
Vijayanagar, vi-jā-ya-nug'-ur.
Vilkomir, vil-ko-mēr'.
Villa Concepcion, vē'lyā kon-thep-thi-on'.
Villafranca, vil-la-fran'ka.
Villani, vil-lā'ni.
Villanueva de la Serena, vē-lyā-nwā'va dā la sā-rā'na.
Villanueva-y-Geltru, vē-lyā-nwā'va-i-hel-troo'.
Villari, vil-lā'ri.
Villa Rica, vē'lyā rē'ka.
Villars, vē-yār'.
Villarsia, vil-lār'si-a.
Villegas, vē-lyā'gas.
Villehardouin, vē-lar-doo-an'.
Villemain, vēl-man'.
Villena, vē-lyā'na.
Villeneuve, vēl-nev'.
Villeneuve-sur-Lot, vēl-nev-sūr-lō'.
Villeroi, vēl-rwā'.
Villiers de l'Isle-Adam, vil-le-ār' d'lē-lā-dam'.
Villon, vil-lon'.
Vimeiro, vē-mā'rō.
Vincennes, van-sen'.
Vincent de Beauvais, van-sen' d' bō-vā'.
Vincent de Paul, van-sen' d' pōl'.
Vindelicia, vin-de-lē'ki-a or vin-de-lē'si-a.
Vindhya, vind'h'ya.
Vinet, vē-nā'.
Vinje, vin'ya.
Vinnitsa, vin-nit'sa.
Violaceæ, vi-ol-ā'sē-ē.
Vionville, vē-on-vēl'.
Viotti, vē-ō'ti.
Vipsania, vip-sā'ni-a or vip-sā'n-i-a.
Virchow, vē'r'chov.
Viriathus, vē-rē-ā'thoos or vir-i-āth'us.
Viscacha, vis-kā'cha.
Vischer, fish'er.
Visconti, vis-kon'ti.
Vistula, vis'tūl-a.
Vitebsk, vit-eb'sk'.
Viterbo, vē-tār'bo.
Vitet, vē-tā'.
Vitré, vē-trā'.
Vitрина, vit-rēn-a.
Vitringa, vit'ring-a.
Vitruvius, vē-troo'vi-ooz or vit-roo'vi-us.
Vivandière, vē-van-dē-ār'.
Vivarin, vi-va-rē'ni.
Vives, vē'vās.
Vivien de Saint-Martin, vē-vē-an' d' sān-mar-tan'.
Vizagapatam, viz-ā-ga-put-um'.
Vizcaya, vith-kā'ya.
Vizianagram, viz-i-a-nug-rum'.
Vlaardingen, vlār'ding-en.
Vladikavkaz, vlā-di-kav-kaz'.
Vladimir, vlā-dē'mēr.
Vladivostok, vlā-di-vos-tok'.
Vodena, vō-dā'na.
Voetius (Voet), voo'ti-ooz (voot).
Voghera, vō-gā'ra.
Vogler, fōg'ler.
Vogt, fōgt.
Vogüé, vō-gū-ā'.
Voiron, vwā-ron'.
Voiture, vwā-tūr'.
Volapük, vō'la-pük.
Volci, vol'kē or vol'si.
Vollmar, fol'mar.
Vollon, vōl-lon'.
Vologda, vō'log-da.
Volsci, vol'ski or vol'si.
Volsunga Saga, vol'soong-a sā'ga.
Voltaire, vol-tār'.
Volterra, vol'tēr-ra.
Voltri, vol'tri.
Voronej, vo-ron'yāzh.
Vorösmarty, vō-res'h'mor-ti.
Vosges, vōzh.
Voss, fos.
Votan, vō-tan'.
Voznesensk, voz-nā-sensk'.
Vranya, vran'ya.
Vratsa, vrat'sa.
Vryburg, vri'boorg.
Volpecula, vol-pek'ūl-a.
Vurjeevandas, ver-jē'van-das.
Vyatka, vyat'ka.
Vyazma, vyaz'ma.
Vyerni, vār'ne.
Vrynwy, vē'nō-ē.
Vyshni-Volochok, vish'nē-vō-lō-chok'.
Waagen, vā'gen.
Wacht am Rhein, vacht'-am-rin.
Wächter, vech'ter.
Wadelai, wad'l-i'.
Wageningen, wā'gen-ing-en.
Wagner, vā'g'ner.
Wahabis, wā'hāb-ēz.
Waikato, wi-kā'to.
Waitz, vits.
Waitzen, vitz'en.
Walachia, wal-āk'i-a.
Walajapet, wa-la-ja-pet'.
Walch, valch.
Walcheren, wal'ker-en.
Waldeck-Pyrmont, val'-dek-pēr-mont.
Waldeck-Rousseau, val'-dek-roo-sō'.
Waldemar, val'dem-ar.
Waldesee, val'der-zā.
Waldseemüller, vald'zā-mū'ler.
Wallin, val'in.
Wallon, val-lon'.
Walther von der Vogel-weide, vāl'ter fon der fōg'el-vid-a.
Wanganui, wan-ga-noo'ē.
Wapiti, wap'i-ti.
Waratah, wa-rā'ta.
Wardha, wār'd-ha.
Warraus, wār'ouz.
Warnambool, war-nam-bool'.
Watteau, vāt-tō'.
Wazan, waz'an.
Wazirabad, wa-zēr-ā-bād'.
Waziri, wa-zēr'ē.
Weber, vāb'er.
Weckherlin, vek'her-lin.
Wei-hai-wei, wā-hi-wā.
Weil, vil.
Weimar, vi'mar.
Weinberge, vin'berg-a.
Weipert, vi'pert.
Weishaupt, vis'haupt.
Weiss, vis.
Weissenburg, vis'en-boorg.
Weissenfels, vis'en-fels.

Weissborn, vis'horn.
 Weibrecht, vit'brecht.
 Weizsäcker, vits'säk-er.
 Wekerle, vek'er-la.
 Welcker, vel'ker.
 Welhaven, vel'hav-en.
 Wella, wel'lä.
 Welwitsch, vel'vich.
 Welwitschia, wel-wich'i-a.
 Wenceslaus, ven'tses-lous.
 Wen-chow, wen-chou'.
 Wendt, vent.
 Werda, verd'ou.
 Werden, verd'en.
 Weregild, wër'gild.
 Wergeland, ver'ga-land.
 Werner, ver'ner.
 Wernigerode, ver-ni-ga-rö'-da.
 Wesel, vâzel.
 Weser, vâzer.
 Weston-super-Mare, west'-on-soop'er-mär'e.
 Westphalia, vest-fäl'i-a or west-fäl'i-a (Eng.).
 Wetterhorn, vet'er-horn.
 Wettin, vet'in.
 Wetzer, vet'ser.
 Wetzlar, vets'lar.
 Weyden, vâden.
 Weyler y Nicolan, vâler i ni-ko-lan'.
 Weyrecht, vi'precht.
 Wichita, wich'e-tä.
 Widin, vëd'in.
 Widsith, wëd'sith.
 Wieleand, vëlant.
 Wieliczka, vyä-lich'ka.
 Wieniawski, vä-nyav'ski.
 Wier, wër.
 Wiertz, vërts.
 Wiesbaden, vës'bäd-en.
 Wiesen, vëzen.
 Wijk-aan-zee, wik'an-zä.
 Wildenbruch, vild'en-brooch.
 Wilhelmina, wil-hel-më'-na.
 Wilhelmshaven, vil-helm'-hä-fen.
 Willaert, vil-lärt'.
 Willems, vil'emz.
 Willemstad, vil'lem-stadt.
 Willibrord, wil'lë-brörd.
 Williamantic, wil-i-man'-tik.
 Windau, vind'ou.
 Windhoek, vind'hook.
 Windischgrätz, vind'ish-gräts.
 Winkelfried, vin'kel-rët.
 Winnipeg, win'i-peg.
 Winona, wi-nö'nä.
 Winterthur, vin'ter-toor.
 Winther, vin'ter.
 Wirsén, ver-sen'.
 Wisby, wiz'bü.
 Wisconsin, wis-kon'sin.
 Wislizenus, viz-li-tsä'-noos.
 Wismar, vis'mar.
 Wissmann, vis'man.
 Wistaria, wis-tär'i-a.

Witenagemôt, wit-en-a-ge-môf'.
 Witkowit, wit-kö'vits.
 Witte, vit'ta.
 Wittenberg, vit'en-berg.
 Vitu (Vitu), wë'too (vë'too).
 Wislocki, vlis-lots'ki.
 Wloclawec, vlots'kav-ets.
 Woermann, ver'man.
 Woguls, vö'goolz.
 Wöhler, vel'er.
 Wolf (Ger.), volf.
 Wolfram von Eschenbach, vol'fram fon esh'en-bach.
 Wollongong, wol-long-gong'.
 Woltmann, völt'man.
 Woollahra, wool-lä'ra.
 Wood, wood.
 Woolwich, wool'ij.
 Woonsocket, woon-sok'et.
 Worcester, woos'ter.
 Worde, vör'da.
 Worms (town), vörmz.
 Worsaae, vör'sä.
 Wörth, vert.
 Wouwerman, wou'ver-man.
 Wrangel, vrang'el.
 Wrede, vrä'da.
 Wriothsley, ri'oths-li.
 Wroxeter, roks'et-er.
 Wrshowitz, vir-sho'vits.
 Wuchang-fu, woo-chang-foo'.
 Wu-chau-fu, woo-chou-foo'.
 Wu-hu, woo-hoo'.
 Wulfsan, woolf'stan.
 Wullenweber, vool'en-väb-er.
 Wundt, voont.
 Würtemberg, vür'tem-berg.
 Wurtz, voorts.
 Würzburg, vürts'boorg.
 Wurzen, voor'tsen.
 Wu-sung, woo-soong'.
 Wuttke, voot'ka.
 Wyandots, wi'an-dots.
 Wyandotte, wi'an-dot.
 Wynants, wi'nants.
 Wyenberg, win'berg.
 Wyoming, wi-ö'ming.
 Wyss, vës.
 Wytenbach, vit'en-bach.
 Wyvern, wi'vern.
 Xanthine, zan'thîn.
 Xanthippus, zan-thip'ous or zan-thip'us.
 Xanthoxylum, zan-thoks'il-um.
 Xavier, zäv'i-er or zä-vi-ä'.
 Xebec, zëbek.
 Xenia, zen'i-a.
 Xenia (town), zën'i-a.
 Xenocrates, zen-ok'ra-täs or zen-ok'ra-tëz.
 Xenon, zën'on.
 Xenophanes, zen-of'an-äs or zen-of'an-ëz.
 Xenophon, zen'ö-fon.

Xerxes, zerk'sëz.
 Ximenez de Cisneros, hi-mä'näh dä this-nä'rös.
 Xylenes (Xylols), zil'enz (zi'lolz).
 Yájnavalkya, yäj-na-val'kya.
 Yakuts, yä'koots.
 Yakutsk, ya-kootsk'.
 Yalu, yä'loo.
 Yama, yä'ma.
 Yamagata, ya-ma-gä'ta.
 Yamaon, ya-nä'on.
 Yanbu, yan'boo.
 Yangtse-kiang, yang-ts'ki-ang'.
 Yarkand, yar-känd'.
 Yarkand-daria, yar-kand-dar'ya.
 Yaroslavl, ya-ro-slav'l.
 Yecla, yä'kla.
 Yegorievsk, yä-gor'yevsk.
 Yeisk, yäsk.
 Yekaterinodar, yä-ka-ter-in-o-där'.
 Yelisaavetpol, yä-li-za-vet-pol'.
 Yenisei, yä-nis-ä'.
 Yeniseisk, yä-ni-säsk'.
 Yessentuki, yes-en-too'ki.
 Yezidis, yez'id-ëz.
 Yggdrasil, ig'dra-sil.
 Yiddish, yid'ish.
 Yo-chou, yö-chou'.
 Yokohama, yo-ko-hä'ma.
 Yonne, yon.
 Yorubas, yö'roo-bas.
 Yosemite, yo-sem'it-ä.
 Youghal, youl.
 Ypres, ëp'r'.
 Ypsilanti, ëp-si-lan'ti.
 Yriarte, i-ri-är'tä.
 Ysage, i-saz'i.
 Ysopet, ë'so-pä.
 Ystad, i'stad.
 Ystradyfodwg, i-strad-u-vod-oog'.
 Yucatan, ü-ka-tän'.
 Yukaghirs, ü-ka-gërz'.
 Yukon, ü'kon.
 Yumas, ü'maz.
 Yün-nan, yun-nan'.
 Yuryev, ür-yev'.
 Yusafzyas, ü-saf-ziz'.
 Yverdon, i-ver-don'.
 Yvetot, ëv'-tö'.
 Zaandam, zän-dam'.
 Zacatecas, tha-ka-tä'kas.
 Zagoskin, za-gos'kin.
 Zagreus, za-grevz' or zag-rüs'.
 Zahn, tsän.
 Zalcucos, zal-ev'koos or za-lü'kus.
 Zama, zä'ma.
 Zambezi, zam-bä'si.
 Zama, zam'i-a.
 Zamora, tha-mö'ra.
 Zamosc, za-mösh'.
 Zanardelli, za-nar-del'li.

Zandvoort, zand'vört.
 Zanella, za-nel'la.
 Zante, zan'ta.
 Zanzibar, zan-zi-bär'.
 Zapolya, za-pol'ya.
 Zapotecs, za-po-tek's'.
 Zara, zä'ra.
 Zaragoza, tha-ra-gö'tha.
 Zea, thä'a.
 Zechstein, tsech'stîn or zek'stîn.
 Zedary, zed'ö-ar-i.
 Zeehan, zëhan.
 Zeerust, zä'roost.
 Zeitun, zä'toon.
 Zeitz, tsits.
 Zeller, tsel'er.
 Zemindar, zem-in-där'.
 Zemstvo, zemst'vo.
 Zenana, zen-än'a.
 Zend-Avesta, zend-av-es'ta.
 Zenker, tsen'ker.
 Zeno (Gr.), zä'no or zë'no.
 Zeno (Ital.), zä'no.
 Zenobia, zen-öb'i-a.
 Zenodotus, zen-ö'döt-ous or zen-od'ö-tus.
 Zephyrus, zef'ür-ous or zef'ür-us.
 Zerafshan, zer-af-shän'.
 Zerbst, tserbst.
 Zermatt, tser-mat'.
 Zeuglodonts, züg'lö-donts.
 Zeugma, züg'ma.
 Zeuss, tsois.
 Zeuxis, zük'sis.
 Zeyla, zä'la.
 Zeyst, zist.
 Zheleznovodsk, zhel-ez-no-vodsk'.
 Ziani, tsä-ä'ni.
 Zichy, zë'shi.
 Ziegler, tsëg'ler.
 Zieten, tsët'en.
 Zimbabue, zim-bäb'wä.
 Zimmermann, tsim'mer-man.
 Zimmern, tsim'ern.
 Zingel, tsing'el.
 Zingiber, zin'ji-ber.
 Zinnia, zin'ni-a.
 Zinzendorf, tsin'tsen-dorf.
 Zipaquira, thi-pa-kë'ra.
 Ziska, zis'ka.
 Zittau, tsit'tou.
 Zittel, tsit'el.
 Zizel, ziz'el.
 Zizkow, zhizh'kof.
 Zlatoust, zla-ta-oost'.
 Znaim, znim.
 Zoe, zö'ä or zö'ë.
 Zetrope, zö'ë-tröp.
 Zoffany, tsof'an-i.
 Zollikoffer, tsol'i-kof-er.
 Zöllner, tsöl'ner.
 Zollverein, tsöl'fer-in.
 Zomba, zom'ba.
 Zombor, zom'bör.
 Zoantharia, zö-ö-an-thär'-i-a.
 Zooid, zö'oid.
 Zoophyte, zö'ö-fit.

Zoospore, zō'ō-spōr.	Zouaves, zwāvz.	Zulus, zoo'loos.	Zweibrücken, tsvi'brük-en.
Zöpfel, tsep'fel.	Zoutpansberg, zout'panz-berg.	Zumala-Carréguy, thoo-mä'la-kar-rä'gi.	Zwickau, tsvik'ou.
Zorndorf, tsorn'dorf.	Zrinyi, zrin'yi.	Zumpt, tsoompt.	Zwingli, tsving'li.
Zoroaster, zō-rō-as'ter.	Zschokke, jok'ka.	Zungaria, zoon-gär'i-a.	Zwittau, tsvit'tou.
Zoroastrianism, zō-rō-as'tri-an-izm.	Zuccaro, zook'ka-ro.	Zunz, tsoonts.	Zwolle, zwol'la.
Zorrilla y Moral, thō-ril'ya i mō-ral'.	Zug, tsoog.	Zürich, tsū'rich.	Zygophyllaceæ, zi-gō-fl-äs'ë-ë.
Zorzi, tsor'tse.	Zukertort, tsook'er-tort.	Zurita, thoo-ré'ta.	Zygophyllum, zi-gof'il-um.
Zosimus, zos'im-oos or zoz'im-us.	Zuider Zee, zoi'der zā or zi'der zē (Eng.).	Zutphen, zut'fen.	Zygostates, zi'go-stäts.
	Zululand, zoo'loo-land.	Zvenigorodka, zvän-i-gor'od-ka.	Zymotic, zim-ot'ik.

